

FINAL

PHASE II SITE INSPECTION
RAPIER SITE 9, AREA 7



Peterson AFB, Colorado

August 2012

FINAL

**Phase II Site Inspection
Rapier Site 9, Area 7**

Peterson AFB, Colorado

Prepared for:

21st Space Wing
Peterson Air Force Base, Colorado

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LIST OF ABBREVIATIONS AND ACRONYMS

AFB	Air Force Base
AFCEE	Air Force Center for Engineering and the Environment, formerly Air Force Center for Environmental Excellence
ARAR	applicable or relevant and appropriate requirements
Area 7	Rapier Site 9, Area 7
ANOVA	analysis of variance
bgs	below ground surface
CCR	Code of Colorado Regulations
CDPHE	Colorado Department of Public Health and the Environment
CI	confidence interval
EPA	Environmental Protection Agency, United States
mg/L	milligram per liter
NFA	no further action
NTU	nephelometric turbidity unit
PVC	polyvinyl chloride
SAIC	Science Applications International Corporation
SI	Site Inspection
TPH	total petroleum hydrocarbons
USAF	United States Air Force
VOC	volatile organic compound

EXECUTIVE SUMMARY

This report for Rapier Site 9, Area 7 (Area 7): Landfill 1611 at Peterson Air Force Base, Colorado, presents the results of the site inspection (SI) performed from April 2011 through January 2012, in accordance with the approved Phase II SI Work Plan (Earth Tech, Inc. [Earth Tech] 2010a) and Work Plan Addendum (Earth Tech 2010b). Area 7 is located on approximately 0.92 acre south of and adjacent to the pistol range backstop berm along the east-central portion of the Rapier Site. The landfill was reportedly created in 1951 as a result of the construction of the pistol range berm and was used until 1991. A Phase I SI was performed from July 2008 through April 2009 to provide additional groundwater data necessary to meet Colorado landfill closure requirements as requested by the Colorado Department of Public Health and Environment and also to support the decision process to determine whether no further action (NFA) would be applicable or if further monitoring or remedial activity is required for this area of concern. The SI Report concluded that lead concentrations may pose a risk to human health and the environment and a continuation of groundwater monitoring was required. As part of the Phase II SI, two existing wells at Area 7 were sampled (S7-MW1, and S7-MW3; S7-MW2 did not yield water) with the objective of detecting migration of contaminants, specifically lead, from the landfill contents to the underlying groundwater.

Data evaluation was performed by comparing lead concentrations against regulatory standards and by using statistical methods such as the parametric analysis of variance (ANOVA) and confidence interval (CI) evaluation. The objective of the data evaluation was to determine if there were any lead impacts to groundwater from Area 7.

There were no exceedances of lead (total or dissolved) in samples from S7-MW1 or S7-MW3. Monitoring well S7-MW2 did not yield water during each quarterly sampling event and therefore, could not be sampled. Based on Phase I water levels at Area 7, groundwater was determined to flow to the west. Water levels in monitoring wells S7-MW1 and S7-MW3 have not changed drastically from 2009 to 2012 and therefore it can be concluded that, despite the lack of water in S7-MW2, groundwater flow direction is still to the west, and S7-MW3 is located in the downgradient direction.

Further evaluation using ANOVA and CI indicated that there is no evidence of significant contamination in the two wells sampled with respect to lead. Based on a review of water levels collected during Phase I and Phase II SI activities, groundwater flow direction is defined at Area 7. Therefore, groundwater quality data were collected from locations appropriate to evaluate potential groundwater impacts from Area 7. The SI data confirm that the groundwater at Area 7 is not impacted by the landfill contents; therefore, the landfill closure requirements are met and Area 7 is recommended for NFA.

1. INTRODUCTION

This document has been prepared for the United States Air Force (USAF) and the Air Force Center for Engineering and the Environment (AFCEE) 311th Human Systems Wing by AECOM Technical Services, Inc., under Contract FA8903-08-D-8770, Task Order 134. This document describes activities and findings associated with the Site Inspection (SI) performed at Peterson Air Force Base (AFB), Colorado. The SI was conducted under the USAF Installation Restoration Program (IRP). The SI was completed in January 2012 in accordance with the Air Force Center for Engineering and the Environment (AFCEE) Model Work Plan (AFCEE 1996), Model Field Sampling Plan, version 1.2 (AFCEE 2002), and Quality Assurance Project Plan, version 4.0 (AFCEE 2006). The SI included four quarterly sampling events over a monitoring period of one year. The SI was performed in accordance with guidance from United States Environmental Protection Agency (EPA), Colorado Department of Public Health and the Environment (CDPHE), and AFCEE.

The area of concern addressed under the SI is Rapier Site 9, Area 7 (Area 7): Landfill 1611. This document discusses project objectives, interprets quarterly groundwater monitoring results to determine if there are any impacts to groundwater from the landfill, and makes recommendations based on the findings of the SI.

1.1 Objectives

The objectives of the SI are as follows:

- Collect groundwater samples to identify potential groundwater contamination, if any;
- Assess the data to provide definitive data to determine the presence and concentration of possible contamination;
- Identify contaminants of potential concern to determine if there are any impacts to groundwater from the landfill; and
- Evaluate the findings of the SI to determine whether any remedial actions or a determination of “no further action” (NFA) is applicable for Area 7.

To support the above objectives, the SI field effort included collection and laboratory analysis of groundwater samples, management of investigation-derived wastes, and record keeping. The sampling protocols and other SI activities are described in the approved Phase II SI Work Plan and Work Plan Addendum (Earth Tech, Inc. [Earth Tech] 2010a and 2010b).

1.2 Site Background

The Rapier Site is located on 137 acres on Colorado Springs Airport property in Colorado Springs, Colorado (Figure 1-1). The property was once leased by the USAF from the City of Colorado Springs to provide training facilities for USAF security forces and fire fighters and storage of munitions. The property has not been occupied by Peterson AFB since approximately 1991. The property was first used by the United States Army prior to 1941. The land and facilities were conveyed back to the city on June 3, 1948. The USAF then leased the land from the City from June 8, 1948, through June 30, 1967.

The Environmental Restoration Program is responsible for cleaning up contamination from past operations thereby reducing risks to human health and the environment. Responsibilities include identifying and characterizing contaminated sites, program planning, budgeting cleanup projects, and providing cradle-to-grave management of restoration activities, ensuring contract oversight, interacting with CDPHE and other stakeholders regarding the cleanup of contaminated sites.

1.3 Organization of Document

This SI Report is organized as follows:

- Section 1: Introduction
- Section 2: Site Description
- Section 3: Site Inspection Results
- Section 4: Conclusions and Recommendations
- Section 5: References

2. SITE DESCRIPTION

This section describes the physical setting of the area of concern evaluated during the SI and presents the results of previous SI activities conducted under the USAF IRP.

2.1 Physical Setting

Area 7 is located on approximately 0.92 acre south of and adjacent to the pistol range backstop berm along the east-central portion of the Rapier Site. The landfill was reportedly created in 1951 as a result of the construction of the pistol range berm and was used until 1991. Previous investigations identified the presence of low concentrations of total petroleum hydrocarbons (TPH) and metals in the soils (Science Applications International Corporation [SAIC] 1996). The location of Area 7 within the Rapier Site is shown on Figure 2-1.

2.1.1 Topography

The Rapier Site is located in an area dominated by gently to strongly rolling high plains in the Colorado Piedmont section of the Great Plains Physiographic Province. The ground surface slopes generally to the southwest. Elevations range from 6,000 to 6,300 feet above mean sea level (USAF 1989). The topography at Area 7 is currently flat but does have an irregular surface which accounts for variations in surface elevation. The topography falls slightly to the west beyond the site boundary.

2.1.2 Geology

The surficial deposits in the vicinity of Peterson AFB consist of unconsolidated alluvium comprising three alluvial units (Broadway Alluvium, Piney Creek Alluvium, and a windblown sand unit). The alluvium is characterized by varying amounts of poorly sorted granitic gravel, well-stratified clay, silt, and sand and is up to 20 feet thick in some areas. The surficial deposits are underlain by bedrock composed primarily of sandstone, siltstone, and shale (USAF 1989). Below surficial and alluvial deposits is the Pierre Shale which is composed primarily of shale beds.

2.1.3 Surface Water Hydrology

The Rapier Site is located in the Fountain Creek Drainage Basin, which is part of the Arkansas River Drainage Basin. The two main streams draining the Fountain Creek drainage basin are Monument Creek and Fountain Creek, which lie to the west of the Rapier Site. Monument Creek converges with Fountain Creek near downtown Colorado Springs. Several tributaries to Fountain Creek are located in the vicinity of the Rapier Site and include Sand Creek, East Fork Sand Creek, and Jimmy Camp Creek. These tributaries provide local surface drainage for the Rapier Site and the surrounding area (USAF 1989).

2.1.4 Groundwater

The principal unconfined aquifer in the region of Peterson AFB is in the Piney Creek alluvial sediments of the Fountain Creek Valley. Alluvial sediments in the vicinity of Area 7 are underlain by bedrock (Pierre Shale), which acts as an aquitard, although, groundwater may flow in the upper weathered portions of the bedrock. This shallow aquifer is isolated from the Denver Basin aquifer system, which is present below some northern areas of Peterson AFB. The

thickness of the shallow aquifer and the depth to the water table in this aquifer vary across the region. Regionally, the shallow aquifer flows to the southwest towards Fountain Creek.

2.2 Previous Investigations

Area 7 is located on approximately 0.92 acre south of and adjacent to the pistol range backstop berm along the east central portion of the Rapier Site. The landfill was reportedly created in 1951 as a result of the construction of the pistol range berm and was used until 1991.

2.2.1 Soil Investigation

SAIC conducted an investigation at the Rapier Site in 1996. Previous investigations identified the presence of low concentrations of TPH and metals in soils. Table 2-1 presents detections above reporting limits (SAIC 1996).

2.2.2 Groundwater Investigation

A groundwater investigation was initiated in response to a request from CDPHE to determine potential impacts from the landfill to meet Colorado landfill closure requirements. Three monitoring wells (S7-MW1 through S7-MW3) were installed upgradient, cross-gradient and downgradient of the former landfill footprint. Twelve groundwater samples were collected over four quarterly sampling events from July 2008 through April 2009 and analyzed for VOCs, metals, cations, anions, and total organic carbon in accordance with the Colorado Solid Waste Regulations. Following groundwater sampling activities, a statistical evaluation using analysis of variance (ANOVA) indicated that there was no evidence of significant contamination in the wells, with the exception of lead.

2.3 Conclusions From Previous Investigations

A risk evaluation concluded that chemicals detected in soil at this site were below background values (for metals only) or do not pose a risk to human or ecological receptors. The groundwater investigation described in the Phase I Area 7 SI Report (AECOM 2009) concluded that lead was a possible contaminant of concern and required further monitoring.

3. SITE INSPECTION RESULTS

The Phase II SI consisted of collection and laboratory analysis of groundwater samples. All SI activities were conducted in accordance with the approved Phase II SI Work Plan (AFCEE 2010a) and Work Plan Addendum (AFCEE 2010b). Analytical samples were shipped via Federal Express to the analytical laboratory following chain-of-custody procedures. As presented in Appendix A, data reduction, validation, assessment, and reporting were performed in accordance with the procedures described in the Quality Assurance Project Plan of the approved Phase II SI Work Plan (AFCEE 2010).

3.1 Groundwater Monitoring System

There are three permanent monitoring wells, S7-MW1, S7-MW2, and S7-MW3, located in the northeast, south, and west portions of Area 7, respectively. The monitoring well locations and approximate site boundaries are shown on Figure 3-1. Monitoring well S7-MW3 lies in the downgradient portion of Area 7, based on an evaluation of water levels collected in April 2009.

A geologic cross section based on the boring logs obtained during the installation of these monitoring wells is presented on Figure 3-2. Groundwater was measured in wells S7-MW1 and S7-MW3 at depths ranging from approximately 75 feet to 85 feet bgs; the saturated zone was limited to less than 10 feet in thickness. Monitoring well S7-MW2 did not yield water during all Phase II sampling events.

A total of 8 groundwater samples were collected from monitoring wells S7-MW1 and S7-MW3 between April 2011 and January 2012. All groundwater samples were analyzed for total and dissolved lead only. During each sampling event, the groundwater elevation was measured in each well immediately prior to purging. Based on an evaluation of water levels collected in April 2009, the groundwater generally flows in a westerly direction (Figure 3-1). Water levels for both the Phase I and Phase II Area 7 SI are presented in Tables 3-1 and 3-2, respectively.

3.2 Groundwater Data Evaluation

Four quarterly sampling events were conducted over a monitoring period of one year (April 2011 through January 2012). The groundwater monitoring data were compared against the regulatory standards and evaluated statistically to determine potential impacts, if any, to the underlying groundwater from Area 7.

3.2.1 Comparative Analysis

A comparative analysis of the four sampling events is presented in Tables 3-3 through 3-6. The lead concentrations were compared against the Basic Standards for Groundwater (5CCR 1002-41).

Dissolved lead was only detected during the first quarterly sampling event from monitoring well S7-MW3 at a concentration of 5.8 µg/L, which is below the domestic water quality standard of 50 µg/L. Dissolved lead was not detected above reporting limits in samples from monitoring well S7-MW1. Total lead was detected in samples from both monitoring wells, but concentrations were below screening criteria.

3.2.2 Statistical Evaluation

The statistical evaluation of groundwater monitoring data consisted of one-way parametric analysis of variance (ANOVA) and confidence interval (CI) analysis.

3.2.2.1 ANOVA

When contamination of the groundwater occurs from a landfill and if the monitoring wells are hydraulically upgradient and hydraulically downgradient from the site, then contamination is unlikely to change the levels of a constituent in all wells by the same amount. Thus, contamination from a landfill can be seen as differences in average concentrations among wells, and such differences can be detected by ANOVA.

A one-way parametric ANOVA was performed to determine whether the groundwater monitoring data for Area 7 provide evidence of the presence of, or an increase in, the level of contamination. The one-way parametric ANOVA was suitable for such evaluation since groundwater data were generated from two wells and were based upon more than three observations with no significant variations due to seasonality. The hypothesis tests assumed that the errors are normally distributed with constant variance. In accordance with EPA guidance (EPA 1989), statistical evaluation consisting of one-way parametric ANOVA was performed for analytes with one or more detections. ANOVA computations for each analyte were performed using the following steps:

Step 1: The concentrations were arranged per well in a data table across all wells where n_i is the number of samples for well i , p is the number of wells (2), and N is the total sample size. The non-detected values were assigned one-half their respective practical quantitation limits (PQLs).

Step 2: The well count (n_i), well total, and well mean were calculated for each well along with the grand count (N), grand total, and grand mean across wells. The sum of squared deviates (SS), the sum of the difference between an individual sample result and the well mean, was calculated for each well, along with the total sum of squared deviates, SS_{total} , across wells. The sum of squared deviates (SS) may also be termed the sum of squares.

Step 3: The sum of squares between well means and the grand mean, SS_{wells} , was calculated.

Step 4: The sum of squares of the differences of observations within wells from the well mean, SS_{error} , was calculated. SS_{error} is the sum of the SS across wells and may also be calculated as $SS_{\text{error}} = SS_{\text{total}} - SS_{\text{wells}}$.

Step 5: The degrees of freedom (dF) were calculated between wells ($p-1$), within wells ($N-p$), and across wells ($N-1$). The mean square (MS) was calculated both between wells (MS_{wells}) and within wells (MS_{error}) as the quotient of SS/dF . An F ratio, ($MS_{\text{wells}}/MS_{\text{error}}$) was then calculated.

Step 6: The ANOVA table was constructed as shown below.

Anova Table					
Source of Variation	Sum of Squares	Degrees of Freedom	Mean Squares	F	Fcrit
Between wells	SSwells	p-1	MSwells= SSwells/(p-1)	F= MSwells/MSerror	Fcrit(p-1,N-p)
Error (within wells)	SSerror	N-p	MSerror= SSerror/ (N-p)		
Total	SStotal	N-1			

Where:

F represents the F-statistic (ability to detect differences among group means).

N represents the total sample size.

p represents the number of wells.

Step 7: The assumption of equal variances among the wells was tested by comparing the calculated F ratio against the tabulated F statistic with (p-1) and (N-p) degrees of freedom at a 5 percent significance level. If the calculated F ratio is less than the tabulated F critical value, the assumption of equal variances holds true and there is no evidence of significant contamination. If the calculated F ratio exceeds the tabulated F critical value, the null hypothesis of equal variances among the wells is unlikely and possible groundwater contamination is suggested.

The above procedures are shown in a sample calculation in Table 3-7. Calculations for all analytes are presented in Appendix B.

3.2.2.2 Confidence Intervals

A CI designed to contain the specified population parameter (the mean concentration at a well in groundwater monitoring) with a designated level of confidence or probability, is determined for each analyte. The CI was calculated for each well using the four rounds of sampling data. Calculations were performed using the following steps:

Step 1: The mean (M) and standard deviation (St.Dev.) of the analyte concentrations were calculated for each well.

Step 2: The CI was calculated for each well using the following equation:

$$M + t(0.99, n-1) \text{ St.Dev.}/n^{1/2} \text{ (upper limit); } M - t(0.99, n-1) \text{ St.Dev.}/n^{1/2} \text{ (lower limit)}$$

where $t(0.99, n-1)$ is obtained from the statistical t-table. The 99th percentile of the t-distribution for four observations is 4.541.

Step 3: The intervals calculated in Step 2 were compared to the regulatory limits. If the regulatory limit is contained in the interval or is above the upper limit, the unit remains within compliance. Statistically significant evidence of contamination is concluded only if the lower limit of the CI exceeds the regulatory limit.

The above procedures are shown in a sample calculation in Table 3-8. The calculations of the CI for each well for all the analytes are presented in Appendix B.

3.2.2.3 Statistical Analysis Results

Two wells at Area 7 were sampled quarterly and analyzed for both dissolved and total lead. Since both wells had the same number of sampling results (n=4), ANOVA calculations were performed to determine whether groundwater monitoring results provided evidence of contamination. Additionally, the CI was evaluated against regulatory standards to determine whether the unit remains within compliance.

ANOVA performed for both dissolved and total lead using $\frac{1}{2}$ the PQL for the nondetected values. Since ANOVA results for both the solitary detection of dissolved lead and the seven of eight detections of total lead produced calculated F values that were less than the critical value of F; the assumption of equal variances holds and there is no evidence of significant contamination.

Similarly, CI evaluation for each well produced a lower limit of the mean (LL) that is less than the regulatory standard, and the unit remains within compliance for both dissolved and total lead.

3.3 Nature and Extent of Contamination

The monitoring program was conducted in accordance with the requirements of 40 Code of Federal Regulations 258.531 to ensure that monitoring results provided an accurate representation of the groundwater quality at Area 7. Concentrations of lead do not exceed the regulatory standards that were used as risk screening criteria and therefore lead does not pose a risk to human health or environment. Statistical evaluation using ANOVA indicated that there is no evidence of significant contamination in the wells sampled with respect to lead.

3.4 Conceptual Site Model

The Rapier Site consists of 137 acres on Colorado Springs Airport property and Area 7 (Landfill 1611) is located on approximately 0.92 acres along the east central portion of the Rapier Site. The landfill was reportedly created in 1951 as a result of the construction of the pistol range berm and was used until 1991. Previous investigations identified low levels of TPH and metals in soil, and lead in groundwater.

The geology at Area 7 consists of approximately 50 to 60 feet of silty sands and clays underlain by thin (10 feet thick or less) intervals of gravelly and silty sand. Bedrock is encountered at approximately 80 to 85 feet bgs. Groundwater at the site is encountered between approximately 75 and 85 feet bgs and flows in a westerly direction, based on an evaluation of water levels collected in April 2009.

Previous investigations identified the presence of low concentrations of TPH and metals in soils and possible lead contamination in groundwater. The recent monitoring program did not identify lead contamination in the two monitoring wells that yielded water at Area 7.

3.5 Potential Applicable or Relevant and Appropriate Requirement Identification

Potential applicable or relevant and appropriate requirements (ARARs) include promulgated environmental requirements, criteria, standards, and other limitations and are typically divided into three categories: chemical-specific, location-specific, and action-specific. Chemical-specific ARARs are regulatory cleanup levels or screening criteria. Location-specific ARARs are requirements that affect the management of contaminated media or the land parcels in which they are managed because of the location of the sites. Action-specific ARARs are requirements that are triggered by the selected remedial alternative and may place restrictions on the manner in which a selected alternative may be achieved. Table 3-9 lists the ARARs that were considered during site inspections at Area 7. Colorado Ground Water Standards were specifically considered for screening of definitive data.

4. CONCLUSIONS AND RECOMMENDATIONS

Table 4-1 summarizes the project objectives introduced in Section 1.1, along with a summary of findings and a reference to the appropriate section in which the issue was addressed. Based on a review of water levels collected during Phase I and Phase II SI activities, groundwater flow direction is defined at Area 7. Therefore, groundwater quality data were collected from locations appropriate to evaluate potential groundwater impacts from Area 7. An evaluation of all soil and groundwater data show that material left in place at Area 7 contains no hazardous constituents at unacceptable levels and therefore, Area 7 is recommended for NFA and may be closed with no use restrictions.

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TABLES

TABLE 2-1
PREVIOUS FIELD INVESTIGATION RESULTS (1996) RAPIER SITE 9, AREA 7
SOIL SAMPLE ANALYTICAL DETECTIONS ABOVE DETECTION LIMITS
PETERSON AIR FORCE BASE, COLORADO
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Sample ID	Analyte	Depth (ft. bgs)	Concentration (mg/kg)	RBSC ^a (mg/kg)	Highest background Concentration (mg/kg)	Detection Limit (mg/kg)
PAFB-07-BH01-001	Antimony (Sb)	24.0-25.0	10	31	10	10
	Chromium (Cr)	24.0-25.0	3	210	9	1
	Copper (Cu)	24.0-25.0	4	2,800	7	1
	Lead (Pb)	24.0-25.0	9	400	14	5
	Zinc (Zn)	24.0-25.0	26	23,000	41	1
	TPH	24.0-25.0	27	NA	NA	10
PAFB-07-BH02-001	Xylenes (total)	24.0-25.5	0.001	320	NA	0.001
	Antimony (Sb)	24.0-25.5	10	31	10	10
	Chromium (Cr)	24.0-25.5	5	210	9	1
	Copper (Cu)	24.0-25.5	6	2,800	7	1
	Lead (Pb)	24.0-25.5	10	400	14	5
	Nickel (Ni)	24.0-25.5	5	1,500	7	4
	Silver (Ag)	24.0-25.5	2	380	3	1
	Zinc (Zn)	24.0-25.5	37	23,000	41	1
	TPH	24.0-25.5	33	NA	NA	10
PAFB-07-BH02-002 ^b	Xylenes (total)	24.0-25.5	0.001	320	NA	0.001
	Antimony (Sb)	24.0-25.5	20	31	10	10
	Arsenic (As)	24.0-25.5	6	0.32	8	5
	Chromium (Cr)	24.0-25.5	18	210	9	1
	Copper (Cu)	24.0-25.5	8	2,800	7	1
	Lead (Pb)	24.0-25.5	10	400	14	5
	Nickel (Ni)	24.0-25.5	5	1,500	7	4
	Silver (Ag)	24.0-25.5	1	380	3	1
	Zinc (Zn)	24.0-25.5	35	23,000	41	1
	TPH	24.0-25.5	31	NA	NA	10
PAFB-07-BH03-001	Arsenic (As)	24.0-25.0	6	0.32	8	5
	Chromium (Cr)	24.0-25.0	5	210	9	1
	Copper (Cu)	24.0-25.0	5	2,800	7	1
	Lead (Pb)	24.0-25.0	8	400	14	5
	Nickel (Ni)	24.0-25.0	4	1,500	7	4
	Silver (Ag)	24.0-25.0	1	380	3	1
	Zinc (Zn)	24.0-25.0	33	23,000	41	1
	TPH	24.0-25.0	27	NA	NA	10
PAFB-07-BH03-002	Chromium (Cr)	86.0-86.5	1	210	9	1
	Copper (Cu)	86.0-86.5	3	2,800	7	1
	Zinc (Zn)	86.0-86.5	16	23,000	41	1
	TPH	86.0-86.5	260	NA	NA	10


TABLE 2-1
PREVIOUS FIELD INVESTIGATION RESULTS (1996) RAPIER SITE 9, AREA 7
SOIL SAMPLE ANALYTICAL DETECTIONS ABOVE DETECTION LIMITS
PETERSON AIR FORCE BASE, COLORADO
Page 2 of 2

Notes:

Source: Science Applications International Corporation (1996)

^aMost conservative RBSC values

^bDuplicate of PAFB-01-SS01-001

 = exceeds RBSC

BH = bore hole

ft. bgs = feet below ground surface

mg/kg = milligram per kilogram

NA = not applicable

RBSC = risk-based screening criterion

SS = surface sample

TPH = total petroleum hydrocarbons

TABLE 3-1
PHASE I SITE INSPECTION WATER LEVEL MEASUREMENTS
RAPIER SITE 9, AREA 7
PETERSON AFB, COLORADO
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Well ID	Measurement Date	Ground Surface elevation (ft amsl)	TOC elevation (ft amsl)	Well Depth Elevation (ft amsl)	Water Level (ft below TOC)	Groundwater elevation (ft amsl)
Site 9, Area 7						
S7-MW1	9/23/2008	6123.48	6126.81	NM	80.73	6046.08
S7-MW1	11/18/2008	6123.48	6126.81	6045.10	79.92	6046.89
S7-MW1	1/22/2009	6123.48	6126.81	NM	79.85	6046.96
S7-MW1	4/1/2009	6123.48	6126.81	6045.04	80.17	6046.64
S7-MW2	7/17/2008	6126.31	6129.81	6042.66	85.41	6044.40
S7-MW2	11/17/2008	6126.31	6129.81	6042.66	84.78	6045.03
S7-MW2	1/22/2009	6126.31	6129.81	6042.66	84.45	6045.36
S7-MW2	4/1/2009	6126.31	6129.81	6042.51	84.63	6045.18
S7-MW3	7/17/2008	6127.32	6130.82	6036.82	88.37	6042.45
S7-MW3	11/18/2008	6127.32	6130.82	6036.82	88.00	6042.82
S7-MW3	1/22/2009	6127.32	6130.82	6036.82	87.16	6043.66
S7-MW3	4/1/2009	6127.32	6130.82	6036.47	87.45	6043.37

Notes

amsl = above mean sea level

ft = feet

NA = not applicable

NM = not measured

TOC = top of casing

TABLE 3-2
PHASE II SITE INSPECTION WATER LEVEL MEASUREMENTS
RAPIER SITE 9, AREA 7
PETERSON AFB, COLORADO
Page 1 of 1

Well ID	Measurement Date	Ground Surface elevation (ft amsl)	TOC elevation (ft amsl)	Well Depth Elevation (ft amsl)	Water Level (ft below TOC)	Groundwater elevation (ft amsl)
Site 9, Area 7						
S7-MW1	4/27/2011	6123.48	6126.81	6045.21	80.49	6046.32
S7-MW1	7/27/2011	6123.48	6126.81	6045.30	80.59	6046.22
S7-MW1	11/10/2011	6123.48	6126.81	6045.30	78.99	6047.82
S7-MW1	1/27/2012	6123.48	6126.81	6045.30	79.55	6047.26
S7-MW2	4/27/2011	6126.31	6129.81	6045.90	Dry	NA
S7-MW2	7/27/2011	6126.31	6129.81	6045.92	Dry	NA
S7-MW2	11/10/2011	6126.31	6129.81	6044.79	Dry	NA
S7-MW2	1/27/2012	6126.31	6129.81	6044.79	Dry	NA
S7-MW3	4/27/2011	6127.32	6130.82	6036.65	87.99	6042.83
S7-MW3	7/27/2011	6127.32	6130.82	6036.74	88.19	6042.63
S7-MW3	11/10/2011	6127.32	6130.82	6036.84	86.53	6044.29
S7-MW3	1/27/2012	6127.32	6130.82	6036.84	86.52	6044.30

Notes

Elevation data from S7-MW2 is inconsistent with previous data from 2008/2009, and therefore is used with prejudice.

amsl = above mean sea level

ft = feet

NA = not applicable

NM = not measured

TOC = top of casing

TABLE 3-3
CHEMICALS DETECTED DURING FIRST QUARTERLY SAMPLING EVENT
RAPIER SITE 9, AREA 7, PETERSON AFB, COLORADO

Page 1 of 1

Method	Analyte	Units	Screening Criteria		S7-MW1	S7-MW3	S7-MW3(FD)
					4/27/2011	4/27/2011	4/27/2011
			Domestic Water Supply Standard	Agricultural Standard	TAMQ	TAMQ	TAMQ
SW6010B	LEAD	µg/L	50	100	ND (25)	38	19
SW6010B	LEAD (DIS)	µg/L	50	100	ND (25)	ND (25)	5.8

Notes:

Samples analyzed for lead (total and dissolved) only

Monitoring well S7-MW2 was dry and therefore could not be sampled.

DIS = dissolved

FD = field duplicate

ND = not detected (associated reporting limit in parentheses)

µg/L = micrograms per liter

TAMQ = Test America Laboratory, Arvada, Colorado

Screening Criteria

Domestic and Agricultural Standard: CDPHE Water Quality Control Commission. 5 CCR 1002-41, Regulation No. 41, Basic Standards for Ground Water. Effective November 30, 2009

TABLE 3-4
CHEMICALS DETECTED DURING SECOND QUARTERLY SAMPLING EVENT
RAPIER SITE 9, AREA 7, PETERSON AFB, COLORADO
Page 1 of 1

Method	Analyte	Units	Screening Criteria		S7-MW1	S7-MW3	S7-MW3(FD)
					7/27/2011	7/27/2011	7/27/2011
			Domestic Water Supply Standard	Agricultural Standard	TAMQ	TAMQ	TAMQ
SW6010B	LEAD	µg/L	50	100	5.9 [J]	14 [J]	17 [J]
SW6010B	LEAD (DIS)	µg/L	50	100	ND (25)	ND (25)	ND (25)

Notes:

Samples analyzed for lead (total and dissolved) only

Monitoring well S7-MW2 was dry and therefore could not be sampled.

DIS = dissolved

FD = field duplicate

ND = not detected (associated reporting limit in parentheses)

µg/L = micrograms per liter

TAMQ = Test America Laboratory, Arvada, Colorado

Validation Flag Definitions (denoted by letter codes within parentheses):

J = The value is an estimated detect.

Screening Criteria

Domestic and Agricultural Standard: CDPHE Water Quality Control Commission. 5 CCR 1002-41, Regulation No. 41, Basic Standards for Ground Water. Effective November 30, 2009

TABLE 3-5
CHEMICALS DETECTED DURING THIRD QUARTERLY SAMPLING EVENT
RAPIER SITE 9, AREA 7, PETERSON AFB, COLORADO

Page 1 of 1

Method	Analyte	Units	Screening Criteria		S7-MW1	S7-MW1(FD)	S7-MW3
					11/10/2011	11/10/2011	11/10/2011
			Domestic Water Supply Standard	Agricultural Standard	TAMQ	TAMQ	TAMQ
SW6010B	LEAD	µg/L	50	100	16 [J]	34 [J]	34 [J]
SW6010B	LEAD (DIS)	µg/L	50	100	ND (25)	ND (25)	ND (25)

Notes:

Samples analyzed for lead (total and dissolved) only

Monitoring well S7-MW2 was dry and therefore could not be sampled.

DIS = dissolved

FD = field duplicate

ND = not detected (associated reporting limit in parentheses)

µg/L = micrograms per liter

TAMQ = Test America Laboratory, Arvada, Colorado

Validation Flag Definitions (denoted by letter codes within parentheses):

J = The value is an estimated detect.

Screening Criteria

Domestic and Agricultural Standard: CDPHE Water Quality Control Commission. 5 CCR 1002-41, Regulation No. 41, Basic Standards for Ground Water. Effective November 30, 2009

TABLE 3-6
CHEMICALS DETECTED DURING FOURTH QUARTERLY SAMPLING EVENT
RAPIER SITE 9, AREA 7, PETERSON AFB, COLORADO
Page 1 of 1

Method	Analyte	Units	Screening Criteria		S7-MW1	S7-MW3	S7-MW3(FD)
					1/27/2012	1/27/2012	1/27/2012
			Domestic Water Supply Standard	Agricultural Standard	TAMQ	TAMQ	TAMQ
SW6010B	LEAD	µg/L	50	100	28	27	23
SW6010B	LEAD (DIS)	µg/L	50	100	ND (25)	ND (25)	ND (25)

Notes:

Samples analyzed for lead (total and dissolved) only

Monitoring well S7-MW2 was dry and therefore could not be sampled.

DIS = dissolved

FD = field duplicate

ND = not detected (associated reporting limit in parentheses)

µg/L = micrograms per liter

TAMQ = Test America Laboratory, Arvada, Colorado

Screening Criteria

Domestic and Agricultural Standard: CDPHE Water Quality Control Commission. 5 CCR 1002-41, Regulation No. 41, Basic Standards for Ground Water. Effective November 30, 2009

TABLE 3-7
SAMPLE COMPUTATION FOR ANOVA
RAPIER SITE 9, AREA 7
PETERSON AIR FORCE BASE, COLORADO
PAGE 1 OF 3

Analyte: Total Lead

Step 1: Resultant sampling concentrations were arranged per well in a data table across all wells where n_i is the number of samples for well i , p is the number of wells (2), and N is the total sample size. The non-detected values were assigned one-half their respective practical quantitation limits (PQLs).

Lead-Total	PAFB07-MW01	PAFB07-MW03	Total
Quarter 1	12.5	38	
Quarter 2	5.9	17	
Quarter 3	34	34	
Quarter 4	28	27	

Step 2: The well count (n_i), well total, and well mean were calculated for each well along with the grand count (N), grand total, and grand mean across wells. The sum of squared deviates (SS), the sum of the difference between an individual sample result and the well mean, was calculated for each well, along with the total sum of squared deviates, SS_{total} , across wells. The sum of squared deviates (SS) may also be termed the sum of squares.

Lead-Total	PAFB07-MW01	PAFB07-MW03	Total
Quarter 1	12.5	38	
Quarter 2	5.9	17	
Quarter 3	34	34	
Quarter 4	28	27	
Count	4	4	8
SUM(x)	80.4	116	196.4
SUM(x ²)	2131.06	3618	5749.06
St.Dev.	13.10242	9.201449	11.51049
Mean	20.1	29	24.55
SS	515.02	254	927.44
Variance	171.6733	84.66667	

x = the sampling result.

Using total lead sampling results from the first well (PAFB07-MW01),

Count = n = 4 samples

Sum(x) = $\sum x = (12.5 + 5.9 + 34 + 28) = 80.4$

Sum(x^2) = $\sum (x^2) = (12.5^2 + 5.9^2 + 34^2 + 28^2) = (156.25 + 34.81 + 1156 + 784) = 2131.06$

St. Dev. = Standard Deviation{12.5, 5.9, 34, 28} = 13.10

Mean = $(12.5 + 5.9 + 34 + 28) / 4 = 20.1$

Sum of squares = SS = $2131 - (80.4)^2 / 4 = 515.02$

Variance = SS / ($n - 1$) = $515.02 / (4 - 1) = 171.7$

In finer detail, the sum of squares for each individual well is the sum of the squares of the difference between the sample result x and the well mean and equal to the sum across sampling events of $(x - M_i)^2$ for each well i ; thus

$$SS_1 = \sum (x_i - M_1)^2$$

TABLE 3-7
SAMPLE COMPUTATION FOR ANOVA
RAPIER SITE 9, AREA 7
PETERSON AIR FORCE BASE, COLORADO
PAGE 2 OF 3

$$= (12.5-20.1)^2 + (5.9-20.1)^2 + (34-20.1)^2 + (28-20.1)^2$$

$$= 515.02$$

Luckily, this summary is equivalent to the more easily calculated form

$$SS_1 = \sum(x_i^2) - (\sum(x_i)/n_1)$$

$$= 2131 - (80.4)^2/4$$

$$= 515.02$$

Similarly, the values across wells are determined for the Total statistics as

Count = $N_T = (4+4) = 8$ samples across all wells

$$\text{Sum}(\sum x) = (80.4 + 116) = 196.4$$

$$\text{Sum}(\sum x^2) = (80.4^2 + 116^2) = 5749.06$$

St. Dev. = Standard Deviation{12.5, 5.9, 34, 28, 38, 17, 34, 27} = 11.51

$$\text{Mean} = M_T = (196.4)/8 = 24.55$$

$$\text{Sum of squares} = SS_{\text{total}} = \sum(x_T^2) - (\sum(x_T)^2/N_T)$$

$$= 5749.06 - (196.4)^2/8 = 927.44$$

Step 3: The sum of squares between well means and the grand mean, SS_{wells} , was calculated.

$$SS_{\text{wells}} = (80.4)^2/4 + (116)^2/4 - (196.4)^2/8$$

$$= 158.42$$

In finer detail, the SS_{wells} is the sum of the squares of the difference between the well mean and the total mean (across groups) and equal to the sum across wells of $n_i \cdot (M_i - M_T)^2$ for each well i ; thus

$$SS_{\text{wells}} = \sum(n_i \cdot (M_i - M_T)^2)$$

$$= 4 \cdot (20.1 - 24.55)^2 + 4 \cdot (29 - 24.55)^2$$

$$= 158.42$$

Luckily, this summary is equivalent to the more easily calculated form

$$SS_{\text{wells}} = \sum(\sum(x_i)^2/n_i) - (\sum(x_T)^2/N_T)$$

$$= (80.4)^2/4 + (116)^2/4 - (196.4)^2/8$$

$$= 158.42$$

Step 4: The sum of squares of the differences of observations within wells from the well mean, SS_{error} , was calculated.

$$SS_{\text{error}} = \sum SS_i$$

$$SS_{\text{error}} = (515.02 + 254)$$

$$= 769.02$$

Or, since SS_{error} may also be calculated as $SS_{\text{error}} = SS_{\text{total}} - SS_{\text{wells}}$,

$$SS_{\text{error}} = SS_{\text{total}} - SS_{\text{wells}}$$

$$= 927.44 - 158.42 = 769.02$$

Step 5: The degrees of freedom (dF) were calculated between wells (p-1), within wells (N-p), and across wells (N-1). The mean square (MS) was calculated both between wells (MS_{wells}) and

TABLE 3-7
SAMPLE COMPUTATION FOR ANOVA
RAPIER SITE 9, AREA 7
PETERSON AIR FORCE BASE, COLORADO
PAGE 3 OF 3

within wells (MS_{error}) as the quotient of SS/dF . An F ratio, ($MS_{\text{wells}}/MS_{\text{error}}$) was then calculated as shown below.

Between wells:

$$dF_{\text{wells}} = p - 1 = 2 - 1 = 1$$

$$MS_{\text{wells}} = SS_{\text{wells}} / dF_{\text{wells}} = 158.42 / 1 = 158.42$$

Within wells (the error within wells):

$$dF_{\text{error}} = N - p = 8 - 2 = 6$$

$$MS_{\text{error}} = SS_{\text{error}} / dF_{\text{error}} = 769.02 / 6 = 128.17$$

Across wells:

$$dF_{\text{total}} = N - 1 = 8 - 1 = 7$$

Step 6: The ANOVA table was constructed as shown below with the calculated F statistic and the tabulated critical value for F with (p-1) and (N-p) degrees of freedom at a 5 percent significance level. For total lead, F critical was determined for 5 and 16 degrees of freedom.

ANOVA TABLE					
Source of Variation	Sum of Squares	Degrees of Freedom	Mean Squares	F	F _{crit}
Between wells	158.42	1	158.42	1.236	5.9874
Error (within wells)	769.02	6	128.17		
Total	927.44	7			

F = F-statistic (ability to detect differences among group means).

N = total sample size.

p = number of wells.

Step 7: The assumption of equal variances among the wells was tested by comparing the calculated F ratio against the tabulated critical value for F with (p-1) and (N-p) degrees of freedom at a 5 percent significance level. If the calculated F ratio is less than the tabulated F critical value, the assumption of equal variances holds true and there is no evidence of significant contamination. If the calculated F ratio exceeds the tabulated F critical value, the null hypothesis of equal variances among the wells is unlikely and possible groundwater contamination is suggested. For total lead, the calculated F value of 1.236 is less than the critical value of 5.9874; so the null hypothesis of equal variances holds true and there is no evidence of significant contamination.

TABLE 3-8
SAMPLE COMPUTATION FOR CI
RAPIER SITE 9, AREA 7
PETERSON AIR FORCE BASE, COLORADO
PAGE 1 OF 1

Analyte: Total Lead

A CI designed to contain the specified population parameter (the mean concentration for a well in groundwater monitoring) with a designated level of confidence or probability, is determined for each analyte. The CI was calculated for each well using the four rounds of sampling data. CI calculations for total lead for the first well (PAFB03-MW01) are shown below.

Step 1: The mean (M) and standard deviation (St.Dev.) of the total lead sampling results tabulated in the ANOVA workup table presented previously are used to develop the confidence interval around the mean. Referring to the ANOVA workup table, results for PAFB07-MW01 total lead were determined as follows:

$$\text{St. Dev.} = \text{Standard Deviation}\{12.5, 5.9, 34, 28\} = 13.10$$

$$\text{Mean} = (12.5 + 5.9 + 34 + 28) / 4 = 20.1$$

Step 2: The CI is calculated for each well using the mean and standard deviation along with a tabulated 99th percentile t-distribution with n degrees of freedom, where n = number of samples in each well. The 99th percentile of the t-distribution for four observations is 4.541. Using the tabulated t-distribution of 4.541, the upper limit and the lower limit of the CI for total lead were calculated for the first well as follows:

$$\text{CI upper limit} = M + t_{(0.99, n-1)} \text{StDev.} / n^{1/2}$$

$$\text{CI upper limit} = 20.1 + 4.541 * 13.10 / 4^{1/2}$$

$$\text{CI upper limit} = 49.84$$

$$\text{CI lower limit} = M - t_{(0.99, n-1)} \text{StDev.} / n^{1/2}$$

$$\text{CI lower limit} = 20.1 - 4.541 * 13.10 / 4^{1/2}$$

$$\text{CI lower limit} = -9.64 \text{ or effectively zero.}$$

Step 3: The calculated CI for each well was compared to the regulatory limit for that analyte. If the regulatory limit is contained within the interval or is above the upper limit, the unit remains within compliance. Statistically significant evidence of contamination is concluded only if the lower limit of the CI exceeds the regulatory limit. Since the regulatory limit of 50 is above the total lead CI determined for the first well, the unit remains within compliance.

CI determination and evaluation are tabulated for each analyte. The CI table for total lead follows below. Since the regulatory standard for groundwater is greater than the CI lower limit (LL) for each well, the unit remains within compliance for total lead.

Confidence Interval	t-crit	Lower Limit	Upper Limit	CDPHE GW Standard	LL > Screen?
PAFB07-MW01	4.541	-9.64904	49.84904	50	No
PAFB07-MW02	4.541	8.10811	49.89189	50	No

CDPHE GW = Colorado Department of Public Health and Environment Groundwater

TABLE 3-9
POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS
RAPIER SITE 9, AREA 7
PETERSON AIR FORCE BASE, COLORADO
PAGE 1 OF 3

Statutory, Regulatory Basis	Citation	Description
Safe Drinking Water Act Colorado Primary Drinking Water Regulations	40 CFR 141-143 5 CCR 1003-1	Primary and secondary drinking water standards that apply to specific contaminants that have been determined to have an adverse effect on human health. These standards, expressed as MCLs and MCLGs, are potential ARARs for groundwater and/or surface water cleanup and replacement standards.
Clean Water Act Ambient Water Quality Criteria	Guidance Criteria 33 USC Sections 1313-1314	Federal water quality criteria established for the protection of human health and aquatic organisms are not enforceable; however, Section 121 (d) (A) of CERCLA states that remedial actions must attain FWQC where they are relevant and appropriate under the circumstances of a release or threatened release.
RCRA MCLs	40 CFR Section 264.94	Concentration limits for hazardous constituents in groundwater used for the protection of groundwater.
Colorado Rules and Regulations Pertaining to Hazardous Waste	6 CCR 1007-3	Provides definitions and the general and specific standards necessary for the storage, treatment, and disposal of hazardous waste.
Colorado Basic Standards for Ground Water	5 CCR 1002-41	Statewide standards and a system of classifying groundwater and adopting water quality standards for such classifications to protect existing and potential uses of groundwater.
Health and Safety Protection	29 CFR Part 1910 29 CFR 1910.120 (b) to (j) 29 CFR 1926 Subpart P	29 CFR 1910 provides guidelines for workers engaged in activities requiring protective health and safety measures regulated by OSHA. Requirements provided in 29 CFR 1910.120 apply specifically to the handling of hazardous waste/materials at uncontrolled hazardous waste sites. Note: OSHA regulations are independent applicable regulatory requirements, not ARARs. 29 CFR 1910.120 (b) through (j) provide guidelines for workers involved in hazardous waste operations and emergency response actions on sites regulated under RCRA and CERCLA. 29 CFR 1926 Subpart P provides guidelines for workers engaged in activities related to construction and utilization of trenches and ditches.
Worker Exposure	29 CFR 1910.1000	Chemical-specific worker exposure guidelines established by OSHA.
Solid Waste Disposal Act	40 CFR Parts 257 and 258 6 CCR 1007-2 6 CCR 1007-3 Part 268	RCRA regulations and land disposal restrictions.

TABLE 3-9
POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS
RAPIER SITE 9, AREA 7
PETERSON AIR FORCE BASE, COLORADO
PAGE 2 OF 3

Statutory, Regulatory Basis	Citation	Description
Solid Waste Determination	40 CFR 260 6 CCR 1007-3 40 CFR 260.30-31 6 CCR 1007-3 Section 260.03-31 40 CFR 261.2 6 CCR 1007-3 Section 261.2 40 CFR 261.4 6 CCR 1007-3 Section 261.4	A solid waste is any discarded material that is not excluded by a variance granted under 40 CFR 260.30 and 260.31. Discarded material includes abandoned, recycled, and waste-like materials. These materials may have any or the following qualities: Abandoned material may be: <ul style="list-style-type: none"> - Disposed - Burned or incinerated - Accumulated, stored, or treated before or in lieu of being abandoned by being disposed, burned, or incinerated Recycled material is: <ul style="list-style-type: none"> - Used in a manner constituting disposal - Burned for energy recovery - Reclaimed - Speculatively accumulated Waste-like material is material that is considered inherently wastelike.
Solid Waste Classification	6 CCR 1007-2 Section 1	If a generator of wastes has determined that the wastes do not meet the criteria for hazardous wastes, they are classified as solid wastes. The Colorado solid waste rules contain solid waste categories: industrial wastes, community wastes, commercial wastes, special wastes, and inert material.
Determination of Hazardous Waste	40 CFR 262.11 6 CCR 1007-3 Part 262.11 40 CFR Part 261 6 CCR 1007-3 Part 261	Wastes generated during remedial activities must be characterized and evaluated according to the following method to determine whether the waste is hazardous: <ul style="list-style-type: none"> - Determine whether the waste is excluded from regulation under 40 CFR 261.4 - Determine whether the waste is listed under 40 CFR 261 - Determine whether the waste is identified in 40 CFR 261 by testing the waste according to specified test methods or by applying knowledge of the hazardous characteristics of the waste in light of the materials or the process used.
Treatment, Storage, or Disposal of RCRA Hazardous Waste	40 CFR 264 6 CCR 1007-3 Part 264	Standards for owners and operators of hazardous waste treatment, storage, and disposal facilities.

TABLE 3-9
POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS
RAPIER SITE 9, AREA 7
PETERSON AIR FORCE BASE, COLORADO
PAGE 3 OF 3

Statutory, Regulatory Basis	Citation	Description
Groundwater Monitoring	40 CFR 264 Subpart F 6 CCR 1007-3 Part 264 Subpart F 2 CCR 402 6 CCR 1007-3	Groundwater monitoring will be conducted for the presence of hazardous constituents in the groundwater downgradient from solid waste management units. Monitoring wells should be constructed and installed according to the requirements of 2 CCR 402. Colorado groundwater regulations specify requirements for determining background groundwater quality.
Protection of Wetlands	Executive Order 11990 Specific 42 USC Section 1344 40 CFR Part 230, Subpart H 33 CFR Parts 320-330 40 CFR 6.302(a) 40 CFR 6, Appendix A, Sections 3(a) and 3(a)	Requires consideration of impacts to wetlands to minimize their destruction, loss, or degradation and to preserve/enhance wetland values. Potentially applicable to activities that would impact wetlands.
Endangered Species Act	16 USC 1531-1544 16 USC 1361-1407 16 USC 4201-4245 50 CFR 17, 200, 222, 227, and 402	Provides for protection and conservation of various species of fish, wildlife, and plants.

Notes:

ARAR = applicable or relevant and appropriate requirement

CCR = Code of Colorado Regulations

CERCLA = Comprehensive Environmental Restoration, Compensation and Liability Act

CFR = Code of Federal Regulations

FWQC = Federal Water Quality Criteria

MCL = maximum containment level

MCLG = maximum containment level goal

OSHA = Occupational Safety and Health Administration

RCRA = Resource Conservation and Recovery Act

USC = United States Code

TABLE 4-1
OBJECTIVES AND FINDINGS FOR RAPIER SITE 9, AREA 7
PETERSON AIR FORCE BASE, COLORADO
PAGE 1 OF 1

Objectives	Findings	Reference
Collect groundwater samples to identify potential groundwater contamination.	A total of 8 groundwater samples were collected from two of the three wells (S7-MW01 and S7-MW03) during the performance period between April 2011 and January 2012. All groundwater samples were analyzed for lead (total and dissolved) only.	Section 3.1, SI
Data assessment to provide definitive data to determine the presence and concentration of possible contamination.	Data assessment performed in accordance with site-specific QAPP.	Appendix A, SI
Identify contaminants of potential concern to define the nature and extent of contamination.	The concentrations of lead do not exceed regulatory limits that are used as risk screening criteria, and therefore do not pose a concern to human health or the environment. This is further supported by the overall statistical evaluation that concludes there is no evidence of significant contamination in the groundwater underlying Area 7.	Section 3.2, Groundwater Data Evaluation, SI
Evaluate the findings of the SI to determine whether any remedial actions or “No Further Action” is applicable for Area 7.	Area 7 is recommended for NFA.	Section 3.3, Nature and Extent of Contamination, SI

Notes:

CCR = Code of Colorado Regulations

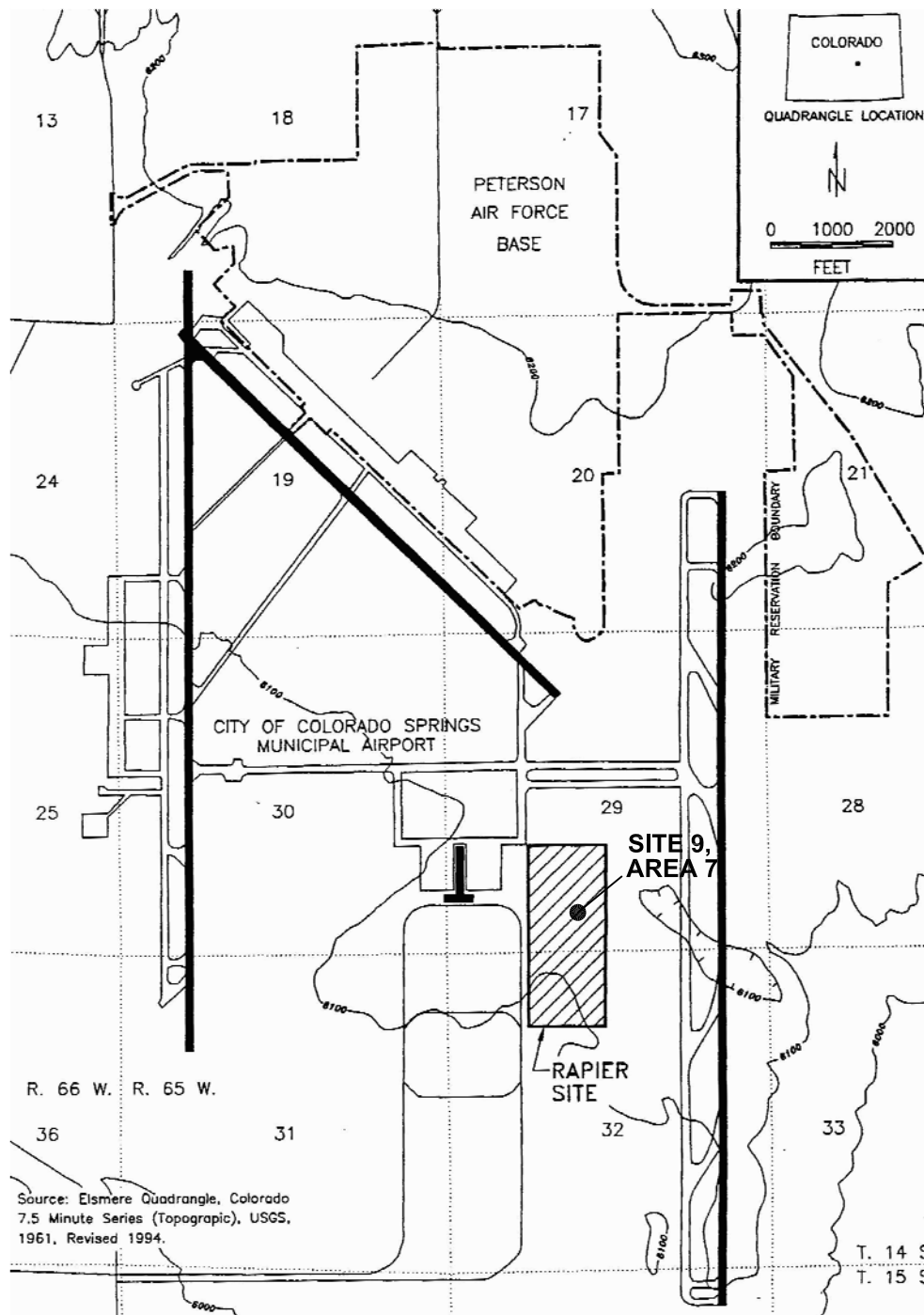
NFA = No Further Action

QAPP = Quality Assurance Project Plan

SI = Site Inspection

VOC = volatile organic compound

FIGURES



1"=3,000'



FIGURE 1-1

SITE LOCATION MAP

RAPIER SITE 9, AREA 7
PETERSON AIR FORCE BASE
COLORADO SPRINGS, COLORADO

MAY 2012

60159616

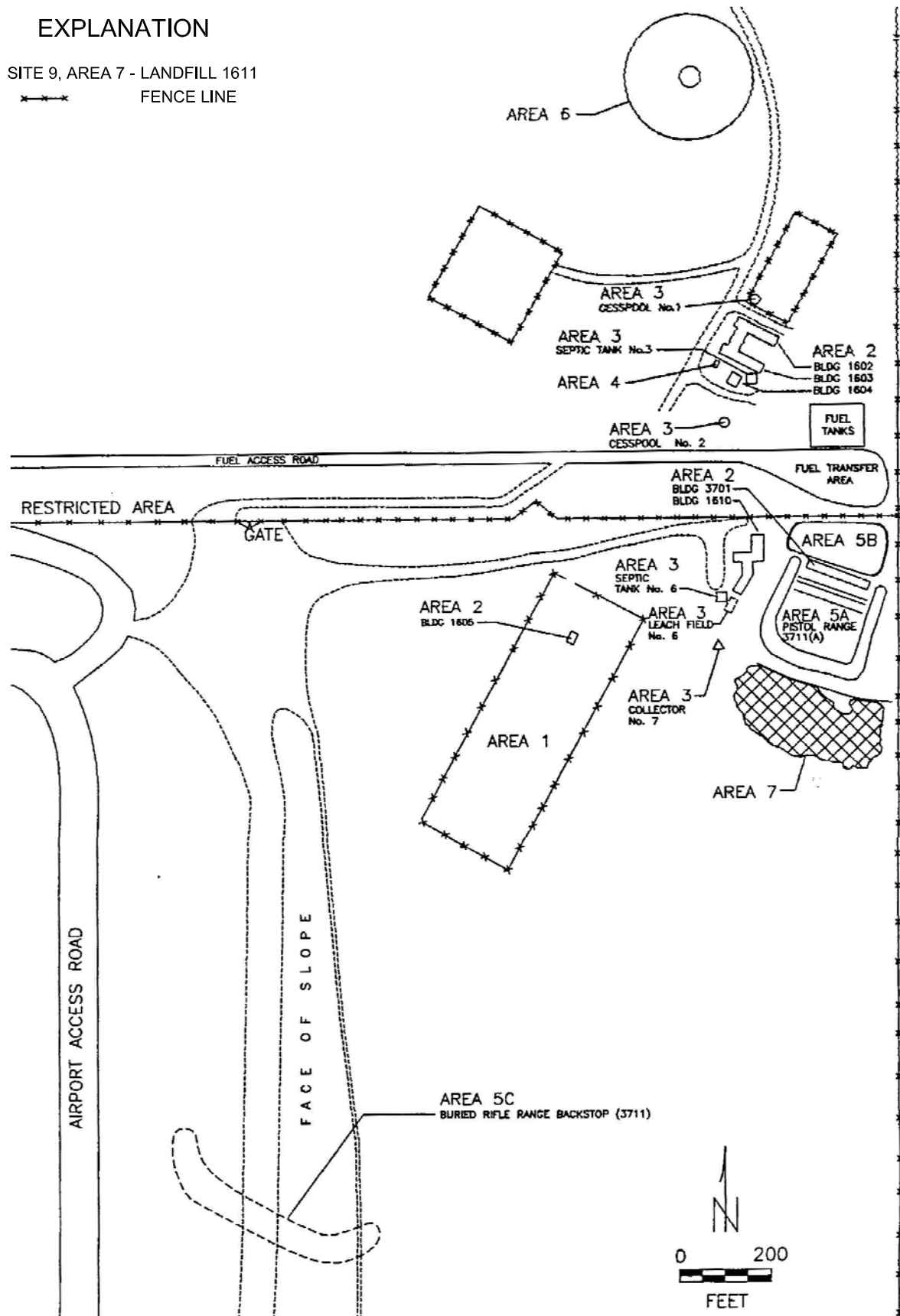
EXPLANATION



SITE 9, AREA 7 - LANDFILL 1611



FENCE LINE



AECOM

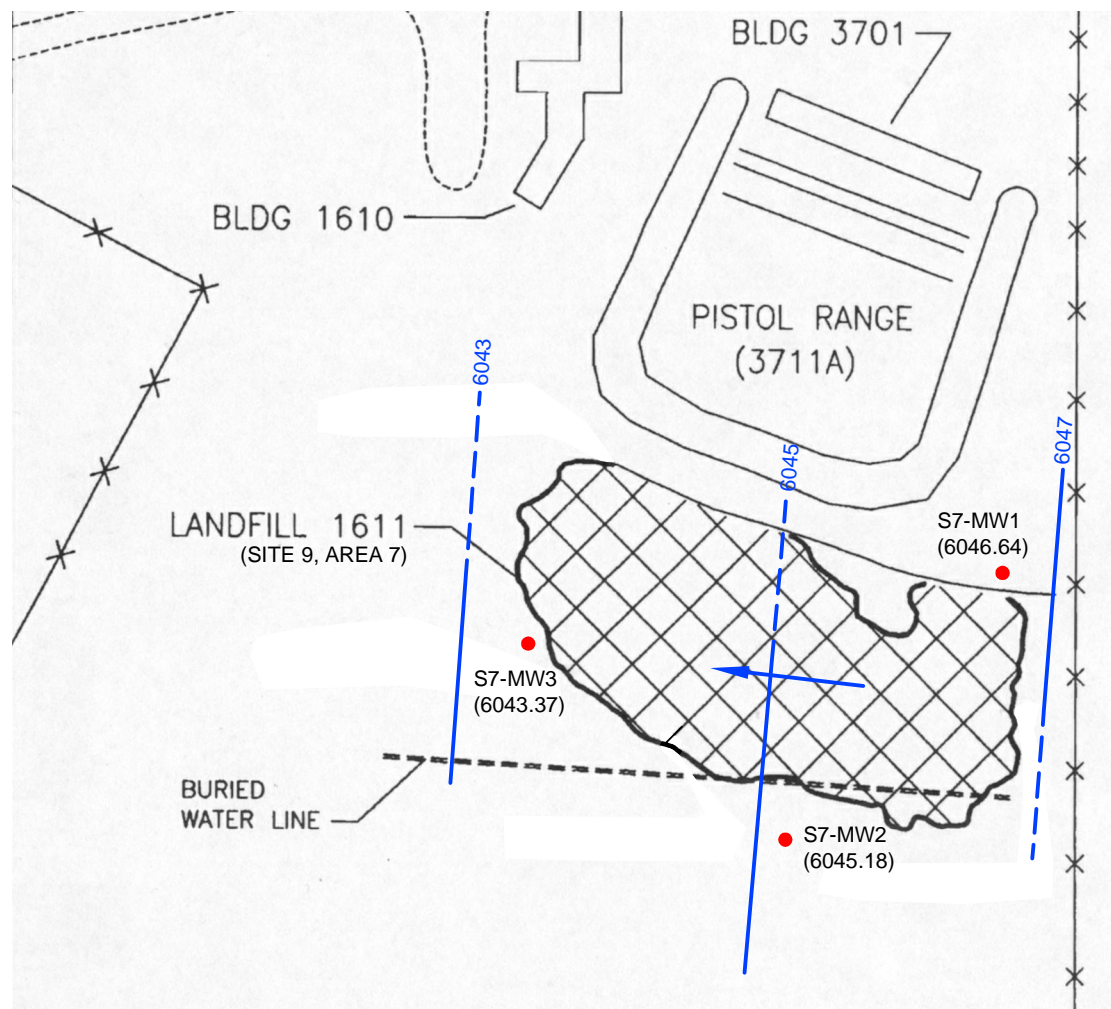
FIGURE 2-1

PROJECT
LOCATION MAP

RAPIER SITE 9, AREA 7
PETERSON AIR FORCE BASE
COLORADO SPRINGS, COLORADO

MAY 2012

60159616



EXPLANATION

- MONITORING WELL LOCATION
- x—x— FENCE LINE
- ▨ LANDFILL BOUNDARY
- ← GROUNDWATER FLOW DIRECTION
- (6046.64) GROUNDWATER ELEVATION (FT AMSL)
- GROUNDWATER CONTOUR (2 FT)
(DASHED WHERE INFERRED)

BASED ON WATER LEVELS COLLECTED IN APRIL 2009
(PHASE 1)



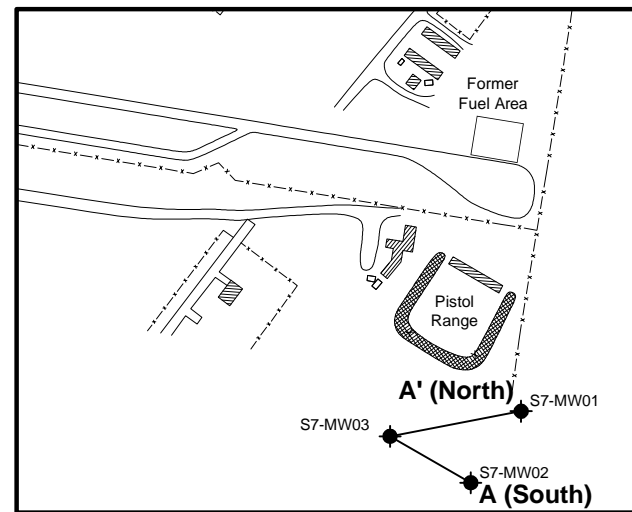
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FIGURE 3-1
PHASE I
GROUNDWATER ELEVATION MAP
 RAPIER SITE 9, AREA 7
 PETERSON AIR FORCE BASE
 COLORADO SPRINGS, COLORADO

AUG 2012

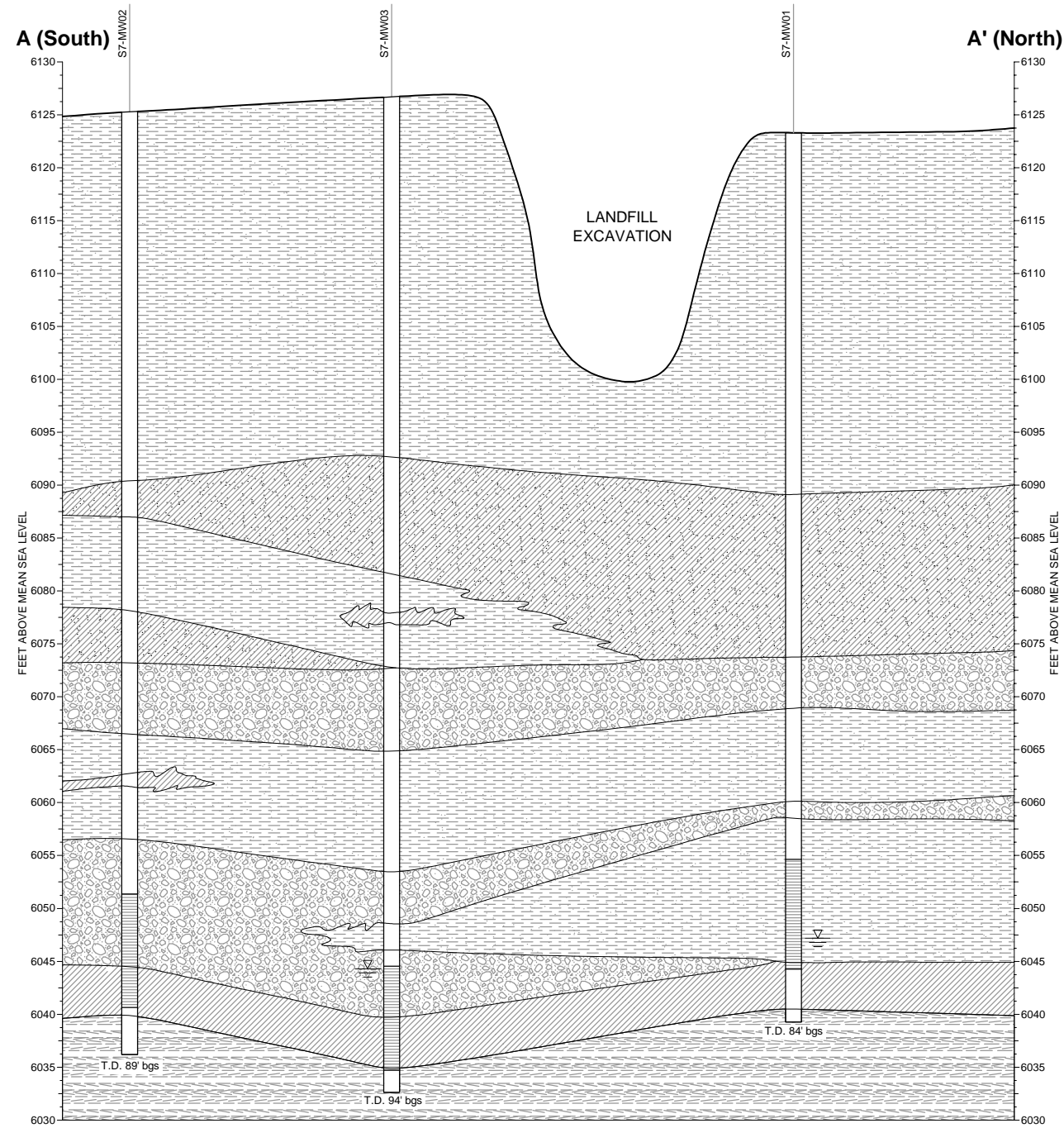
60159616

FILE: L:\GROUP\C AD\PETERSON_AFB\MAY2012\AREA 7 SEC AA.DWG



Cross Section A-A' Location Plan

Scale: 1"=400'



0 7.5 15 Feet
Vertical Scale

AECOM

FIGURE 3-2
GEOLOGIC CROSS SECTION

RAPIER SITE 9, AREA 7
PETERSON AIR FORCE BASE
COLORADO SPRINGS, COLORADO
AUG 2012 60159616

APPENDIX A
QUALITY ASSURANCE REPORT
(On CD)

DATA COMPLIANCE CHECK - TECHNICAL REVIEW
AECOM Technical Services
Test America Laboratories Inc, Denver CO, SDGs 280-15164
AFCEE - Peterson AFB
Phase II Sampling, April 2011 Event
Report date: 6/14/2011 & 10/14/2011
Category 2 Review
Reviewer: Cathy Larson & Karen Munns

DATA VALIDATION SUMMARY:

Analytical quality was evaluated using the criteria specified in the Quality Assurance Project Plan (QAPP) Site Inspection Site 3 Peterson Air Force Base Colorado Springs , Colorado dated June 2008 and the Air Force Center for Environmental Excellence (AFCEE) Technical Services Quality Assurance Program, version 4.0.02, May 2006. Discussions of reviewed QC issues follow.

METHODS:

SW846 - 6010B	Metals by Inductively Coupled Plasma (ICP) Atomic Emission Spectrometry
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SW846 = Test Methods for Evaluating Solid Waste, Physical/Chemical Methods

SAMPLES:

Field ID	Location	Lab ID	Sample Type	Date & Time Collected		Analytical Method
PAFB07-MW01-N-042711	PAFB07-MW01	280-15164-1	N	27-Apr-2011	1355	SW6010B
PAFB07-MW03-N-042711	PAFB07-MW03	280-15164-2	N	27-Apr-2011	1200	SW6010B
PAFB07-MW03-FD-042711FD	PAFB07-MW03	280-15164-3FD	FD	27-Apr-2011	1200	SW6010B

Sample Integrity

1. The sample containers were received intact, and properly preserved on 4/28/11 at Test America Laboratories, Inc.
2. The temperature acceptance criteria of $\leq 6^{\circ}\text{C}$ (degrees Celsius) was met. No data qualifiers were required.
3. Dedicated sample equipment was used and equipment blanks were not required.
4. Sample labels identified the samples as being from site PAFB03 while the COC form noted samples were from site PAFB07. Samples were verified and logged in as being from PAFB07.

Lead by Method 6010B total and dissolved - (2 investigative and 1 field duplicate aqueous samples)

1. The following QC items were evaluated and met criteria: holding times, method blanks, initial and continuing calibration blanks (ICB & CCBs), limit of detection standard, initial and continuing calibration verification standards (ICV & CCVs), inter-element correction verification standards (ICSA & ICSAB), laboratory control sample (LCS) percent recoveries (%Rs), matrix spike/matrix spike duplicate (MS/MSD) %Rs and relative percent difference (RPDs), post digestion spike (PDS) %Rs, and the serial dilution percent differences (%D).
2. A PDS was performed on project sample PAFB07-MW01-N-042711 for dissolved lead and on project sample PAFB07-MW03-FD-042711 for total lead, all %Rs were in control.
3. A serial dilution was performed on project sample PAFB07-MW01-N-042711 for dissolved lead and on project sample PAFB07-MW03-FD-042711 for total lead. Concentrations were less than 50x the MDL and the %Ds did not apply.
4. An MS/MSD was performed on project sample PAFB07-MW01-N-042711 for dissolved lead. %Rs and RPDs were in control.
5. An LCS and LCS duplicate were used to assess precision for total lead and %Rs and RPDs were in control.
6. Sample location PAFB07-MW03 was used for the field duplicate. Results were as follows:

Analyte	Units	Concentration		RPD
		Parent	Duplicate	
Total				
Lead	ug/L	38	19	nc
Dissolved				
Lead	ug/L	<2.6	5.8	nc

RPDs were not calculated (nc) because detected values in either the parent or duplicate were below the reporting limit (RL) of 25 ug/L. Results were assessed using the criteria of \pm RL and were in control. Qualification was not required.

Reviewer: Karen H. Plunns ^{for Cathy Larson} Date: 6/24/11

QC Reviewer: Karen H. Plunns Date: 10/17/11

Database Entry Person: DH Date: 10/25/11

Analytical Data

Client: AECOM Technical Services Inc.

Job Number: 280-15164-1

Client Sample ID: PAFB07-MW01-N-042711

Lab Sample ID: 280-15164-1

Date Sampled: 04/27/2011 1355

Client Matrix: Water

Date Received: 04/28/2011 1000

6010B Metals (ICP)

Analysis Method: 6010B
Prep Method: 3010A
Dilution: 1.0
Analysis Date: 05/10/2011 2231
Prep Date: 05/09/2011 1430

Analysis Batch: 280-66695
Prep Batch: 280-64782

Instrument ID: MT_026
Lab File ID: 26c051011.asc
Initial Weight/Volume: 50 mL
Final Weight/Volume: 50 mL

Analyte	Result (ug/L)	Qualifier	MDL	RL
Lead	2.6	U	2.6	25

6010B Metals (ICP)-Dissolved

Analysis Method: 6010B
Prep Method: 3005A
Dilution: 1.0
Analysis Date: 05/12/2011 1539
Prep Date: 05/11/2011 1500

Analysis Batch: 280-67147
Prep Batch: 280-65178

Instrument ID: MT_026
Lab File ID: 26a051211.asc
Initial Weight/Volume: 50 mL
Final Weight/Volume: 50 mL

Analyte	Result (ug/L)	Qualifier	MDL	RL
Lead	2.6	U	2.6	25

✓
6/24/11

Analytical Data

Client: AECOM Technical Services Inc.

Job Number: 280-15164-1

Client Sample ID: PAFB07-MW03-N-042711

Lab Sample ID: 280-15164-2

Date Sampled: 04/27/2011 1200

Client Matrix: Water

Date Received: 04/28/2011 1000

6010B Metals (ICP)

Analysis Method:	6010B	Analysis Batch:	280-66695	Instrument ID:	MT_026
Prep Method:	3010A	Prep Batch:	280-64782	Lab File ID:	26c051011.asc
Dilution:	1.0			Initial Weight/Volume:	50 mL
Analysis Date:	05/10/2011 2233			Final Weight/Volume:	50 mL
Prep Date:	05/09/2011 1430				

Analyte	Result (ug/L)	Qualifier	MDL	RL
Lead	38		2.6	25

6010B Metals (ICP)-Dissolved

Analysis Method:	6010B	Analysis Batch:	280-67147	Instrument ID:	MT_026
Prep Method:	3005A	Prep Batch:	280-65178	Lab File ID:	26a051211.asc
Dilution:	1.0			Initial Weight/Volume:	50 mL
Analysis Date:	05/12/2011 1601			Final Weight/Volume:	50 mL
Prep Date:	05/11/2011 1500				

Analyte	Result (ug/L)	Qualifier	MDL	RL
Lead	2.6	U	2.6	25



Analytical Data

Client: AECOM Technical Services Inc.

Job Number: 280-15164-1

Client Sample ID: PAFB07-MW03-FD-042711

Lab Sample ID: 280-15164-3

Date Sampled: 04/27/2011 1200

Client Matrix: Water

Date Received: 04/28/2011 1000

6010B Metals (ICP)

Analysis Method:	6010B	Analysis Batch:	280-66695	Instrument ID:	MT_026
Prep Method:	3010A	Prep Batch:	280-64782	Lab File ID:	26c051011.asc
Dilution:	1.0			Initial Weight/Volume:	50 mL
Analysis Date:	05/10/2011 2236			Final Weight/Volume:	50 mL
Prep Date:	05/09/2011 1430				

Analyte	Result (ug/L)	Qualifier	MDL	RL
Lead	19	F	2.6	25

6010B Metals (ICP)-Dissolved

Analysis Method:	6010B	Analysis Batch:	280-67147	Instrument ID:	MT_026
Prep Method:	3005A	Prep Batch:	280-65178	Lab File ID:	26a051211.asc
Dilution:	1.0			Initial Weight/Volume:	50 mL
Analysis Date:	05/12/2011 1604			Final Weight/Volume:	50 mL
Prep Date:	05/11/2011 1500				

Analyte	Result (ug/L)	Qualifier	MDL	RL
Lead	5.8	F	2.6	25

DATA COMPLIANCE CHECK - TECHNICAL REVIEW
AECOM Technical Services
Test America Laboratories Inc, Denver CO, SDGs 280-22645-1 and 280-22704-1
AFCEE - Peterson AFB 3rd Quarter Sampling 2011
Report date: 2/24/2012
Category 2 Review
Reviewer: Karen M. Munns

DATA VALIDATION SUMMARY:

Analytical quality was evaluated using the criteria specified in the Quality Assurance Project Plan (QAPP) Site Inspection Site 3 Peterson Air Force Base Colorado Springs, Colorado dated June 2008 and the Air Force Center for Environmental Excellence (AFCEE) Technical Services Quality Assurance Program, version 4.0.02, May 2006. Discussions of reviewed QC issues per method follow.

METHODS:

SW846 - 6020	Metals by Inductively Coupled Plasma – Mass Spectrometry (ICP-MS)
SW846 - 6010B	Metals by Inductively Coupled Plasma (ICP) Atomic Emission Spectrometry
SW846 - 8260B	Volatile Organic Compounds (VOCs) by Gas Chromatography (GC)/Mass Spectrometry (MS)
SM2320B	Alkalinity as Carbonate and Bicarbonate
MCAWW 300	Anions by Ion Chromatography
SW846 9060A	Total Organic Carbon (TOC) by Flame Ionization Detection

SW846 = Test Methods for Evaluating Solid Waste, Physical/Chemical Methods

MCAWW = Methods for Chemical Analysis of Waters and Wastes, Environmental Protection Agency

SM = Standard Methods of Analysis, 18th Edition

SAMPLES, LABORATORY ID, ALIQUOT, and MATRIX: See Table 1 at end of document.

DATA COMPLIANCE SUMMARY:

Based on the data compliance review, data for the above samples are:

_____	Acceptable for use
_____X_____	Acceptable as qualified
_____	Some data unacceptable for use
_____	All data unacceptable for use

Sample Integrity

1. The sample containers were received intact, within the temperature acceptance criteria of $\leq 6^{\circ}\text{C}$ (degrees Celsius), and properly preserved on 11/10/2011 (280-22645) and 11/11/11 (280-22704) at Test America Laboratories, Inc. in Arvada Colorado.
2. Dedicated sample equipment was used and an equipment blank was not required.
3. The chain of custody forms (COCs) showed the incorrect site (PAFB07 rather than PAFB03) in one of the COC matrix spike (MS) and matrix spike duplicate (MSD) ID fields in error. The laboratory was directed to disregard this error, and a hand-corrected COC was scanned and sent to the lab for their records.

Method 6020, total and dissolved

1. The following QC items were evaluated: hold times, MBs, LCS %Rs, initial and continuing calibration blanks (ICBs and CCBs), initial and continuing calibration verifications (ICVs, CCVs), RL check standard %Rs, matrix spike/matrix spike duplicate (MS/MSD) %Rs and relative percent difference (RPD), serial dilution percent differences (%Ds), post digestion spike (PDS) %Rs, and comparison of reported results to the raw data. All dissolved metals results were verified to be less than or equal to the total metals results for each sample.
2. The analysis of the ICSA interference check standard solution by Method 6020 shows concentrations for antimony, cadmium and thallium at levels greater than 2 times the MDL for both total and dissolved metals analyses (cadmium at $\frac{1}{2}$ the RL). The laboratory narrative indicated that the solution contained trace impurities and that the results are not due to matrix interference. Field sample concentrations were not equivalent to the interferent (aluminum, iron, calcium, and magnesium) concentrations in the ICSA standard, so the ICSA results do not apply to the field samples. No data qualifiers were assigned.
3. Thallium was detected in some initial and continuing calibration blanks (ICBs and CCBs). Concentrations ranged from 0.022 to 0.0348 $\mu\text{g/L}$. Both dissolved and total results were analyzed with CCBs with trace thallium detections. Sample detections less than the RL of 0.2 $\mu\text{g/L}$ (5x the highest blank = 0.18 $\mu\text{g/L}$) were UB qualified, as not detected at the RL. See Table 3 at the end of this document for a summary of the applied qualifiers.
4. Sample location PAFB03-MW05 was collected as the field duplicate for Method 6020 total and dissolved metals and results are summarized in Table 2 at the end of this document. When results were greater than the RL, an RPD was calculated. If one or both detected results are less than the RL, the acceptance criteria is set at $\pm\text{RL}$. The calculated RPD for metals shown in bold exceeded the control criteria of $\leq 20\%$ and all associated detected results for samples included in this validation report were J qualified as estimated. Samples that had been qualified J or M for alternate reasons required no further qualification. Metals were qualified based on the sample fraction, total metals were qualified based on the total FD results, and the dissolved metals were qualified based on the dissolved metals FD results.
5. The serial dilution and PDS analyses were performed on both the total and dissolved metals samples from PAFB03-MW05-N-110911 (280-22645-6). Serial dilution %Ds (where applicable) and PDS %Rs were in control. Qualification was not required.
6. The total and dissolved metals MS/MSD was performed on sample PAFB03-MW05-N-110911 (280-22645-6). All total and dissolved metals %Rs and RPDs were within control limits with the exception of total antimony; dissolved antimony met criteria. Total antimony was recovered at 52% and 53% in the MS and MSD (respectively), outside the 80 - 120% recovery criteria. (The PDS met criteria). The method citation used for the Method 6020 sample digestion (SW-846 3020A) does not include antimony in the list of

acceptable metals. All total antimony sample results were M qualified due to the observed matrix effects, the bias is potentially low.

Method 6010B total and dissolved

1. The following QC items were evaluated : hold times, MBs, LCS %Rs, initial and continuing calibration blanks (ICBs and CCBs), ICVs, CCVs, RL check standard %Rs, MS/MSD %Rs and RPDs, serial dilution percent differences (%Ds), PDS %Rs, and comparison of reported results to the raw data. All dissolved metals results were verified to be less than or equal to the total metals results for each sample. Both SDG samples were analyzed in a single batch.
2. The metals samples were analyzed in two sets, with barium and silver being analyzed separately. Silver was detected in the method blank associated with the dissolved investigative samples at a concentration equal to the MDL, 0.93µg/L. Silver was detected in three of the associated dissolved samples at a similar concentration less than the RL. Silver results less than the RL (dissolved only) were U B qualified as not detected at the RL. See Table 3 at the end of this document for summarized sample qualifiers.
3. Sodium was detected at trace concentrations in some of the associated instrument blanks (CCBs). All associated sample concentrations were greater than the RL, qualifiers were not required.
4. The analysis of the ICSA interference check standard solution by Method 6010 shows concentrations for several target metals greater than 2 times the MDL for both total and dissolved metals analyses (vanadium approaching ½ the RL). The laboratory narrative indicated that the solution contained trace impurities and that the results are not due to matrix interference. Field sample concentrations were not equivalent to the interferent (aluminum, iron, calcium, and magnesium) concentrations in the ICSA standard, so the ICSA results do not apply to the field samples. No data qualifiers were assigned.
5. Sample location PAFB03-MW05 was used for the field duplicate for total and dissolved metals and sample PAFB07-MW01 for total and dissolved lead, results are summarized in Table 2 at the end of this document. When results were greater than the RL, an RPD was calculated. If one or both detected results are less than the RL, the acceptance criteria was set at ±RL. The calculated RPD for metals shown in bold exceeded the control criteria of ≤20% and all associated detected results for samples (total metals associated with total metals FD results, etc.) included in this validation report were J qualified as estimated. All samples collected from site PAFB07 were J qualified as a result of the PAFB07-MW01 FD results, and site PAFB03 samples were qualified due to the PAFB03-MW05 FD results. Samples that had been qualified J or M for other reasons required no further qualification.
6. The serial dilution and PDS analyses were performed on both the total and dissolved metals samples from PAFB03-MW05-N-110911 (280-22645-6). Serial dilution %Ds (where applicable) and PDS %Rs were in control. Qualification was not required.
7. The total and dissolved metals MS/MSD was performed on sample PAFB03-MW05-N-110911 (280-22645-6) and results were provided with SDG 280-22645. All total and dissolved metals %Rs and RPDs were within control limits and qualification was not required.

Method 8260B VOCs

1. The following QC items were evaluated and met criteria: initial calibration (ICAL), second source calibration verification standard (SSCV), continuing calibration verification standard (CCV), GC/MS tunes, and internal standard area counts and retention times, holding times, surrogate %Rs, LCS %Rs, MS/MSD %Rs, and reporting limits (RLs) versus sample dilution as appropriate.
2. Samples were unpreserved and the analyses were performed within the hold time of 7 days from collection to analysis.

- All VOC samples were analyzed undiluted, reporting limits met QAPP criteria.
- VOCs were not detected in the associated method blanks (MBs) with the exception of acetone at 1.68µg/L in the analytical batch 280-96466 (11/15/11); the method blank associated with VOC analyses performed on SDG 280-22645-1. Acetone was not detected in the associated samples, qualifiers were not applied.
- A trip blank was included with each sample shipment. Chloroform was detected in both trip blanks PAFB-TRIP-TB-110911 and PAFB-TRIP-TB-111011 at a concentration of 0.17µg/L, less than the 2.0µg/L RL. Chloroform was either not detected or detected at a concentration greater than the RL in the associated samples and qualification for chloroform was not required. No other TB detections were observed.
- A field duplicate sample pair was collected from PAFB03-MW05-N-110911(280-22645-6 and 280-22645-7). The results are provided in Table 2 at the end of this document. All VOC detected results agreed within the QAPP-specified $\leq 20\%$ RPD. No qualifiers were applied as a result of the FD samples.
- A MS/MSD was analyzed from site PAFB03-MW05-N-110911 and results were provided with SDG 280-22645. This MS/MSD was used for evaluation of all project samples included in this data validation report. All target analyte %Rs and RPDs were within the DoD QSM criteria with the exceptions summarized below. RPD outliers only affect detected sample results. Additional qualifiers were not applied to any associated results less than the RL which were already qualified as estimated. See the summary of applied qualifiers in Table 3 at the end of this document.

MS/SD Parent Field ID (Lab ID)	Outlier Target	Outlier Result	Criteria (%)	Action
PAFB03-MW05-N-110911 (280-22645-6)	2-Butanone	RPD = 25%	20	Detected sample results M qualified.
	4-Methyl-2-pentanone	RPD = 28%	20	
	Chloroethane	RPD = 21%	20	
	Vinyl Chloride	RPD = 23%	20	
	Chloromethane	MS = 54%R	56 - 131	All results M or UM qualified.
	Trichlorofluoromethane	MS = 55%R RPD = 24%	57 - 129 20	

Method 300 – Major Anions

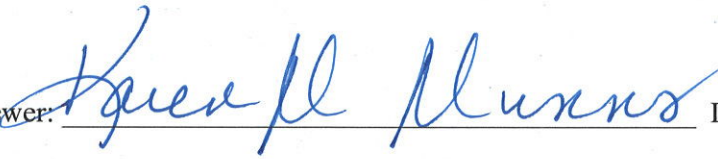
- The following QC items were evaluated and met criteria: holding times, ICAL, ICB, CCBs, ICV, CCVs, MBs, LCS/LCSD %Rs and RPDs, MS/MSD %Rs and RPDs and laboratory duplicate RPDs.
- An MS/MSD was performed on sample PAFB03-MW05-N-110911 (280-22645-6) and results were provided with SDG 280-22645. MS and MSD %Rs and RPDs were within QAPP-specified 85 - 115% recovery control criteria. A non-project MS/MSD was also performed with SDG 280-22704. Non-project MS/MSDs were considered but were not utilized to qualify project samples since matrix similarity to project samples could not be guaranteed. Sample qualification was not necessary.
- A field duplicate pair was collected from PAFB03-MW05-N-110911(280-22645-6 and 280-22645-7). The results are provided in Table 2 at the end of this document. Calculated RPDs were less than the control criteria of 20% and data qualifiers were not required.
- Sample PAFB03-MW03-N-110911 (280-22645-4) was analyzed at a dilution for nitrate as nitrogen in order to analyze the concentration within the calibrated range. The reporting limit was raised accordingly. No sample qualification was necessary.


Method SM2320 Total, Carbonate, and Bicarbonate Alkalinity

1. The following QC items were performed, evaluated, and met criteria: holding times. Per the QAPP, alkalinity data are defined as screening quality data and required QC is collecting a field duplicate at a 10% frequency. LCS, and MS/MSD analyses are not performed with the samples.
2. Bicarbonate alkalinity was detected in the method blank associated with SDG 280-22645-1 at 1.1mg/L, equal to the method detection limit (MDL). Alkalinity was either not detected or detected at a concentration greater than the RL in the associated samples and qualification was not required.
3. The analytical method specified in the QAPP was EPA 310.1. The analytical method reported as being used in the data package was SM2320B. No action was required due to this change.
4. A field duplicate pair was collected from location PAFB03-MW05-N-110911(280-22645-6 and 280-22645-7). The results are provided in Table 2 at the end of this document. Bicarbonate alkalinity was detected in both samples greater than the RL, and the calculated RPD met the $\leq 20\%$ RPD QC acceptance criteria. Data qualification is not required.

Method 9060 Total Organic Carbon

1. The following QC items were evaluated and met criteria: holding times, MBs, ICAL, ICB, ICVs, CCBs, CCVs, MBs, LCS/LCSD %Rs and RPDs, .
2. TOC MS/MSDs were performed per SDG on samples PAFB03-MW05-N-110911 (280-22645-6) and PAFB03-MW06-N-111011 (280-22704-1). %Rs and RPDs were within control criteria and sample qualification was not necessary.
3. A laboratory duplicate was not performed in either SDG for this method, and an assessment could not be made. However, since the LCS/LCSD RPD and MS/MSD RPD were within criteria, laboratory precision was met and data usability was not affected.
4. A field duplicate pair was collected from location PAFB03-MW05-N-110911(280-22645-6 and 280-22645-7). The results are provided in Table 2 at the end of this document. The calculated RPD was within the control criteria of 20%. No qualifiers were applied.

Reviewer:  Date: 2/28/12

QC Reviewer:  Date: 2-28-12


Database Entry Person:  Date: 3/1/2012

TABLE 1
SAMPLES COLLECTED
Peterson Air Force Base, November 2011
TestAmerica Laboratories Inc., Denver, CO

Field ID	Location	280-22704 Lab ID	Sample Type	Date & Time Collected		Analytical Method
PAFB03-MW06-N-111011	PAFB03-MW06	280-22704-1	N	10-Nov-2011	0930	A2320
PAFB03-MW06-N-111011	PAFB03-MW06	280-22704-1	N	10-Nov-2011	0930	E300
PAFB03-MW06-N-111011	PAFB03-MW06	280-22704-1	N	10-Nov-2011	0930	E300
PAFB03-MW06-N-111011	PAFB03-MW06	280-22704-1	N	10-Nov-2011	0930	SW6010B
PAFB03-MW06-N-111011	PAFB03-MW06	280-22704-1	N	10-Nov-2011	0930	SW6020
PAFB03-MW06-N-111011	PAFB03-MW06	280-22704-1	N	10-Nov-2011	0930	SW8260B
PAFB03-MW06-N-111011	PAFB03-MW06	280-22704-1	N	10-Nov-2011	0930	SW9060
PAFB07-MW03-N-111011	PAFB07-MW03	280-22704-2	N	10-Nov-2011	0905	SW6010B
PAFB07-MW01-N-111011	PAFB07-MW01	280-22704-3	N	10-Nov-2011	0820	SW6010B
PAFB07-MW01-FD-111011FD	PAFB07-MW01	280-22704-4FD	FD	10-Nov-2011	0820	SW6010B
PAFB-TRIP-TB-111011	FIELDQC	280-22704-5	TB	10-Nov-2011	0730	SW8260B

Field ID	Location	280-22645 Lab ID	Sample Type	Date & Time Collected		Analytical Method
PAFB-TRIP-TB-110911	FIELDQC	280-22645-1	TB	09-Nov-2011	0900	SW8260B
PAFB03-MW01-N-110911	PAFB03-MW01	280-22645-2	N	09-Nov-2011	1500	A2320
PAFB03-MW01-N-110911	PAFB03-MW01	280-22645-2	N	09-Nov-2011	1500	E300
PAFB03-MW01-N-110911	PAFB03-MW01	280-22645-2	N	09-Nov-2011	1500	E300
PAFB03-MW01-N-110911	PAFB03-MW01	280-22645-2	N	09-Nov-2011	1500	SW6010B
PAFB03-MW01-N-110911	PAFB03-MW01	280-22645-2	N	09-Nov-2011	1500	SW6020
PAFB03-MW01-N-110911	PAFB03-MW01	280-22645-2	N	09-Nov-2011	1500	SW8260B
PAFB03-MW01-N-110911	PAFB03-MW01	280-22645-2	N	09-Nov-2011	1500	SW9060
PAFB03-MW02-N-110911	PAFB03-MW02	280-22645-3	N	09-Nov-2011	1215	A2320
PAFB03-MW02-N-110911	PAFB03-MW02	280-22645-3	N	09-Nov-2011	1215	E300
PAFB03-MW02-N-110911	PAFB03-MW02	280-22645-3	N	09-Nov-2011	1215	E300
PAFB03-MW02-N-110911	PAFB03-MW02	280-22645-3	N	09-Nov-2011	1215	SW6010B
PAFB03-MW02-N-110911	PAFB03-MW02	280-22645-3	N	09-Nov-2011	1215	SW6020
PAFB03-MW02-N-110911	PAFB03-MW02	280-22645-3	N	09-Nov-2011	1215	SW8260B
PAFB03-MW02-N-110911	PAFB03-MW02	280-22645-3	N	09-Nov-2011	1215	SW9060
PAFB03-MW03-N-110911	PAFB03-MW03	280-22645-4	N	09-Nov-2011	1319	A2320
PAFB03-MW03-N-110911	PAFB03-MW03	280-22645-4	N	09-Nov-2011	1319	E300
PAFB03-MW03-N-110911	PAFB03-MW03	280-22645-4	N	09-Nov-2011	1319	E300
PAFB03-MW03-N-110911	PAFB03-MW03	280-22645-4	N	09-Nov-2011	1319	SW6010B
PAFB03-MW03-N-110911	PAFB03-MW03	280-22645-4	N	09-Nov-2011	1319	SW6020
PAFB03-MW03-N-110911	PAFB03-MW03	280-22645-4	N	09-Nov-2011	1319	SW8260B
PAFB03-MW03-N-110911	PAFB03-MW03	280-22645-4	N	09-Nov-2011	1319	SW9060
PAFB03-MW04-N-110911	PAFB03-MW04	280-22645-5	N	09-Nov-2011	1405	A2320
PAFB03-MW04-N-110911	PAFB03-MW04	280-22645-5	N	09-Nov-2011	1405	E300
PAFB03-MW04-N-110911	PAFB03-MW04	280-22645-5	N	09-Nov-2011	1405	E300
PAFB03-MW04-N-110911	PAFB03-MW04	280-22645-5	N	09-Nov-2011	1405	SW6010B
PAFB03-MW04-N-110911	PAFB03-MW04	280-22645-5	N	09-Nov-2011	1405	SW6020
PAFB03-MW04-N-110911	PAFB03-MW04	280-22645-5	N	09-Nov-2011	1405	SW8260B
PAFB03-MW04-N-110911	PAFB03-MW04	280-22645-5	N	09-Nov-2011	1405	SW9060

TABLE 1
SAMPLES COLLECTED
Peterson Air Force Base, November 2011
TestAmerica Laboratories Inc., Denver, CO

Field ID	Location	280-22645 Lab ID	Sample Type	Date & Time Collected		Analytical Method
PAFB03-MW05-N-110911	PAFB03-MW05	280-22645-6	N	09-Nov-2011	1051	A2320
PAFB03-MW05-N-110911	PAFB03-MW05	280-22645-6	N	09-Nov-2011	1051	E300
PAFB03-MW05-N-110911	PAFB03-MW05	280-22645-6	N	09-Nov-2011	1051	E300
PAFB03-MW05-N-110911	PAFB03-MW05	280-22645-6	N	09-Nov-2011	1051	SW6010B
PAFB03-MW05-N-110911	PAFB03-MW05	280-22645-6	N	09-Nov-2011	1051	SW6020
PAFB03-MW05-N-110911	PAFB03-MW05	280-22645-6	N	09-Nov-2011	1051	SW8260B
PAFB03-MW05-N-110911	PAFB03-MW05	280-22645-6	N	09-Nov-2011	1051	SW9060
PAFB03-MW05-N-110911MS	PAFB03-MW05	280-22645-6MS	MS	09-Nov-2011	1051	E300
PAFB03-MW05-N-110911MS	PAFB03-MW05	280-22645-6MS	MS	09-Nov-2011	1051	E300
PAFB03-MW05-N-110911MS	PAFB03-MW05	280-22645-6MS	MS	09-Nov-2011	1051	SW6010B
PAFB03-MW05-N-110911MS	PAFB03-MW05	280-22645-6MS	MS	09-Nov-2011	1051	SW6020
PAFB03-MW05-N-110911MS	PAFB03-MW05	280-22645-6MS	MS	09-Nov-2011	1051	SW8260B
PAFB03-MW05-N-110911MS	PAFB03-MW05	280-22645-6MS	MS	09-Nov-2011	1051	SW9060
PAFB03-MW05-N-110911SD	PAFB03-MW05	280-22645-6SD	SD	09-Nov-2011	1051	E300
PAFB03-MW05-N-110911SD	PAFB03-MW05	280-22645-6SD	SD	09-Nov-2011	1051	E300
PAFB03-MW05-N-110911SD	PAFB03-MW05	280-22645-6SD	SD	09-Nov-2011	1051	SW6010B
PAFB03-MW05-N-110911SD	PAFB03-MW05	280-22645-6SD	SD	09-Nov-2011	1051	SW6020
PAFB03-MW05-N-110911SD	PAFB03-MW05	280-22645-6SD	SD	09-Nov-2011	1051	SW8260B
PAFB03-MW05-N-110911SD	PAFB03-MW05	280-22645-6SD	SD	09-Nov-2011	1051	SW9060
PAFB03-MW05-FD-110911FD	PAFB03-MW05	280-22645-7FD	FD	09-Nov-2011	1100	A2320
PAFB03-MW05-FD-110911FD	PAFB03-MW05	280-22645-7FD	FD	09-Nov-2011	1100	E300
PAFB03-MW05-FD-110911FD	PAFB03-MW05	280-22645-7FD	FD	09-Nov-2011	1100	E300
PAFB03-MW05-FD-110911FD	PAFB03-MW05	280-22645-7FD	FD	09-Nov-2011	1100	SW6010B
PAFB03-MW05-FD-110911FD	PAFB03-MW05	280-22645-7FD	FD	09-Nov-2011	1100	SW6020
PAFB03-MW05-FD-110911FD	PAFB03-MW05	280-22645-7FD	FD	09-Nov-2011	1100	SW8260B
PAFB03-MW05-FD-110911FD	PAFB03-MW05	280-22645-7FD	FD	09-Nov-2011	1100	SW9060

FD = Field duplicate

N = Normal investigative sample

MS = Matrix spike

SD = MS Duplicate

TB = Trip Blank

TABLE 2
Field Duplicate Pair Results
Peterson Air Force Base, November 2011

Parent Field ID (Lab ID)	FD Field ID (Lab ID)	Method	Target Analyte	Parent Result	FD Result	RPD	RL
PAFB03-MW05- N-110911 280-22645-6	PAFB03-MW05- FD-110911 280-22645-7	SW9060	Total Organic Carbon	1.6	1.8	12	1
		SW8260B	1,1,1-Trichloroethane	0.13	0.14	< ±RL	1
		SW8260B	1,1,2-Trichloroethane	0.26	0.26	< ±RL	1
		SW8260B	1,1-Dichloroethane	3.9	3.9	0	1
		SW8260B	1,2-Dichloroethane	0.43	0.42	< ±RL	0.5
		SW8260B	1,2-Dichloropropane	2.3	2.3	0	1
		SW8260B	1,4-Dichlorobenzene	0.12	0.14	< ±RL	0.5
		SW8260B	Chloroform	0.32	0.35	9	0.3
		SW8260B	cis-1,2-Dichloroethylene	1.4	1.4	0	1
		SW8260B	Dichloromethane	1	1.2	< ±RL	2
		SW8260B	Tetrachloroethene	1.6	1.5	7	1
		SW8260B	Trichloroethene (Tce)	0.68	0.65	< ±RL	1
		SW6010B	Arsenic	6.1	5.7	< ±RL	30
		SW6010B	Barium	210	290	32	50
		SW6010B	Barium (Diss)	120	130	8	50
		SW6010B	Beryllium	0.73	1.3	< ±RL	4
		SW6010B	Calcium	140000	150000	7	1100
		SW6010B	Calcium (Diss)	130000	130000	0.0	1100
		SW6010B	Chromium	18	31	53	10
		SW6010B	Cobalt	5.6	10	< ±RL	60
		SW6010B	Copper	11	19	53	10
		SW6010B	Lead	12	22	< ±RL	25
		SW6010B	Magnesium	23000	25000	8	1000
		SW6010B	Magnesium (Diss)	20000	20000	0	1000
		SW6010B	Nickel	11	19	< ±RL	20
		SW6010B	Nickel (Diss)	1.9	1.6	< ±RL	20
		SW6010B	Potassium	4800	5900	21	1000
		SW6010B	Potassium (Diss)	2600	2500	4	1000
		SW6010B	Sodium	45000	45000	0	1000
		SW6010B	Sodium (Diss)	44000	44000	0	1000
		SW6010B	Vanadium	30	48	46	10
		SW6010B	Vanadium (Diss)	0	1.2	< ±RL	10
		SW6010B	Zinc	57	96	51	20
		SW6010B	Zinc (Diss)	12	0	< ±RL	20
		SW6020	Antimony	0.24	0.3	< ±RL	1
		SW6020	Antimony (Diss)	0.082	0.093	< ±RL	1
		SW6020	Cadmium	0.23	0.38	< ±RL	2
		SW6020	Cadmium (Diss)	0.062	0.055	< ±RL	2
		SW6020	Selenium	3	4.6	42	2
		SW6020	Selenium (Diss)	1.6	1.5	< ±RL	2
		SW6020	Thallium	0.2	0.33	49	0.2
		E300	Chloride	41	41	0	3
		E300	Nitrate As Nitrogen	7.1	7	1	0.5
		E300	Sulfate (As SO4)	25	25	0	5
		A2320	Alkalinity, Bicarbonate	460	450	2	
PAFB07-MW01- N-111011 280-22704-3	PAFB07-MW01- FD-111011 280-22704-4	SW6010B	Lead	16	34	72	25
		SW6010B	Lead (Diss)	U	U	-	25

TABLE 3
Qualified Sample Results
Peterson Air Force Base, November 2011

Field Sample ID	Laboratory ID	Test Method	Target Analyte	Result	Applied Flags	Units	Reason
PAFB03-MW01-N-110911	280-22645-2	SW6010B	Barium	310	J	µg/L	High FD Variability, >20% RPD
PAFB03-MW02-N-110911	280-22645-3	SW6010B	Barium	93	J	µg/L	
PAFB03-MW03-N-110911	280-22645-4	SW6010B	Barium	550	J	µg/L	
PAFB03-MW04-N-110911	280-22645-5	SW6010B	Barium	320	J	µg/L	
PAFB03-MW05-N-110911	280-22645-6	SW6010B	Barium	210	J	µg/L	
PAFB03-MW05-FD-110911FD	280-22645-7	SW6010B	Barium	290	J	µg/L	
PAFB03-MW06-N-111011	280-22704-1	SW6010B	Barium	280	J	µg/L	
PAFB03-MW01-N-110911	280-22645-2	SW6010B	Chromium	60	J	µg/L	
PAFB03-MW02-N-110911	280-22645-3	SW6010B	Chromium	7.4	J	µg/L	
PAFB03-MW03-N-110911	280-22645-4	SW6010B	Chromium	59	J	µg/L	
PAFB03-MW04-N-110911	280-22645-5	SW6010B	Chromium	37	J	µg/L	
PAFB03-MW05-N-110911	280-22645-6	SW6010B	Chromium	18	J	µg/L	
PAFB03-MW05-FD-110911FD	280-22645-7	SW6010B	Chromium	31	J	µg/L	
PAFB03-MW06-N-111011	280-22704-1	SW6010B	Chromium	58	J	µg/L	
PAFB03-MW06-N-111011	280-22704-1	SW6010B	Cobalt	11	J	µg/L	
PAFB03-MW01-N-110911	280-22645-2	SW6010B	Copper	29	J	µg/L	
PAFB03-MW02-N-110911	280-22645-3	SW6010B	Copper	6	J	µg/L	
PAFB03-MW03-N-110911	280-22645-4	SW6010B	Copper	53	J	µg/L	
PAFB03-MW04-N-110911	280-22645-5	SW6010B	Copper	27	J	µg/L	
PAFB03-MW05-N-110911	280-22645-6	SW6010B	Copper	11	J	µg/L	
PAFB03-MW05-FD-110911FD	280-22645-7	SW6010B	Copper	19	J	µg/L	
PAFB03-MW06-N-111011	280-22704-1	SW6010B	Copper	35	J	µg/L	
PAFB07-MW03-N-111011	280-22704-2	SW6010B	Lead	34	J	µg/L	
PAFB07-MW01-N-111011	280-22704-3	SW6010B	Lead	16	J	µg/L	
PAFB07-MW01-FD-111011FD	280-22704-4	SW6010B	Lead	34	J	µg/L	
PAFB03-MW01-N-110911	280-22645-2	SW6010B	Potassium	6900	J	µg/L	
PAFB03-MW02-N-110911	280-22645-3	SW6010B	Potassium	3000	J	µg/L	
PAFB03-MW03-N-110911	280-22645-4	SW6010B	Potassium	9200	J	µg/L	
PAFB03-MW04-N-110911	280-22645-5	SW6010B	Potassium	6400	J	µg/L	
PAFB03-MW05-N-110911	280-22645-6	SW6010B	Potassium	4800	J	µg/L	
PAFB03-MW05-FD-110911FD	280-22645-7	SW6010B	Potassium	5900	J	µg/L	
PAFB03-MW06-N-111011	280-22704-1	SW6010B	Potassium	8300	J	µg/L	
PAFB03-MW01-N-110911	280-22645-2	SW6010B	Vanadium	81	J	µg/L	
PAFB03-MW02-N-110911	280-22645-3	SW6010B	Vanadium	15	J	µg/L	
PAFB03-MW03-N-110911	280-22645-4	SW6010B	Vanadium	98	J	µg/L	
PAFB03-MW04-N-110911	280-22645-5	SW6010B	Vanadium	61	J	µg/L	
PAFB03-MW05-N-110911	280-22645-6	SW6010B	Vanadium	30	J	µg/L	
PAFB03-MW05-FD-110911FD	280-22645-7	SW6010B	Vanadium	48	J	µg/L	
PAFB03-MW06-N-111011	280-22704-1	SW6010B	Vanadium	67	J	µg/L	
PAFB03-MW01-N-110911	280-22645-2	SW6010B	Zinc	130	J	µg/L	
PAFB03-MW02-N-110911	280-22645-3	SW6010B	Zinc	37	J	µg/L	

TABLE 3
Qualified Sample Results
Peterson Air Force Base, November 2011

Field Sample ID	Laboratory ID	Test Method	Target Analyte	Result	Applied Flags	Units	Reason
PAFB03-MW03-N-110911	280-22645-4	SW6010B	Zinc	210	J	µg/L	High FD Variability, >20% RPD
PAFB03-MW04-N-110911	280-22645-5	SW6010B	Zinc	120	J	µg/L	
PAFB03-MW05-N-110911	280-22645-6	SW6010B	Zinc	57	J	µg/L	
PAFB03-MW05-FD-110911FD	280-22645-7	SW6010B	Zinc	96	J	µg/L	
PAFB03-MW06-N-111011	280-22704-1	SW6010B	Zinc	130	J	µg/L	
PAFB03-MW01-N-110911	280-22645-2	SW6020	Selenium	4	J	µg/L	
PAFB03-MW02-N-110911	280-22645-3	SW6020	Selenium	3.2	J	µg/L	
PAFB03-MW03-N-110911	280-22645-4	SW6020	Selenium	13	J	µg/L	
PAFB03-MW04-N-110911	280-22645-5	SW6020	Selenium	4.1	J	µg/L	
PAFB03-MW05-N-110911	280-22645-6	SW6020	Selenium	3	J	µg/L	
PAFB03-MW05-FD-110911FD	280-22645-7	SW6020	Selenium	4.6	J	µg/L	
PAFB03-MW06-N-111011	280-22704-1	SW6020	Selenium	7.9	J	µg/L	
PAFB03-MW01-N-110911	280-22645-2	SW6020	Thallium	0.36	J	µg/L	
PAFB03-MW03-N-110911	280-22645-4	SW6020	Thallium	0.88	J	µg/L	
PAFB03-MW04-N-110911	280-22645-5	SW6020	Thallium	0.38	J	µg/L	
PAFB03-MW05-N-110911	280-22645-6	SW6020	Thallium	0.2	J	µg/L	
PAFB03-MW05-FD-110911FD	280-22645-7	SW6020	Thallium	0.33	J	µg/L	
PAFB03-MW06-N-111011	280-22704-1	SW6020	Thallium	0.37	J	µg/L	
PAFB03-MW01-N-110911	280-22645-2	SW6010B	Silver (Diss)	1.2	UB	µg/L	Blank Detects
PAFB03-MW02-N-110911	280-22645-3	SW6010B	Silver (Diss)	1.2	UB	µg/L	
PAFB03-MW03-N-110911	280-22645-4	SW6010B	Silver (Diss)	0.94	UB	µg/L	
PAFB03-MW02-N-110911	280-22645-3	SW6020	Thallium	0.12	UB	µg/L	
PAFB03-MW01-N-110911	280-22645-2	SW6020	Thallium (Diss)	0.061	UB	µg/L	
PAFB03-MW02-N-110911	280-22645-3	SW6020	Thallium (Diss)	0.023	UB	µg/L	
PAFB03-MW03-N-110911	280-22645-4	SW6020	Thallium (Diss)	0.035	UB	µg/L	
PAFB03-MW05-N-110911	280-22645-6	SW6020	Thallium (Diss)	0.024	UB	µg/L	
PAFB03-MW05-FD-110911FD	280-22645-7	SW6020	Thallium (Diss)	0.03	UB	µg/L	
PAFB03-MW06-N-111011	280-22704-1	SW6020	Thallium (Diss)	0.027	UB	µg/L	Low MS/MSD %Rs
PAFB03-MW01-N-110911	280-22645-2	SW6020	Antimony	0.25	M	µg/L	
PAFB03-MW02-N-110911	280-22645-3	SW6020	Antimony	0.49	M	µg/L	
PAFB03-MW03-N-110911	280-22645-4	SW6020	Antimony	0.35	M	µg/L	
PAFB03-MW04-N-110911	280-22645-5	SW6020	Antimony	0.27	M	µg/L	
PAFB03-MW05-N-110911	280-22645-6	SW6020	Antimony	0.24	M	µg/L	
PAFB03-MW05-FD-110911FD	280-22645-7	SW6020	Antimony	0.3	M	µg/L	
PAFB03-MW06-N-111011	280-22704-1	SW6020	Antimony	0.63	M	µg/L	
PAFB03-MW01-N-110911	280-22645-2	SW8260B	Chloromethane	0	UM	µg/L	
PAFB03-MW02-N-110911	280-22645-3	SW8260B	Chloromethane	0	UM	µg/L	
PAFB03-MW03-N-110911	280-22645-4	SW8260B	Chloromethane	0	UM	µg/L	
PAFB03-MW04-N-110911	280-22645-5	SW8260B	Chloromethane	0	UM	µg/L	
PAFB03-MW05-N-110911	280-22645-6	SW8260B	Chloromethane	0	UM	µg/L	

TABLE 3
Qualified Sample Results
Peterson Air Force Base, November 2011

Field Sample ID	Laboratory ID	Test Method	Target Analyte	Result	Applied Flags	Units	Reason
PAFB03-MW05-FD-110911FD	280-22645-7	SW8260B	Chloromethane	0	UM	µg/L	Low MS/MSD %Rs
PAFB03-MW06-N-111011	280-22704-1	SW8260B	Chloromethane	0.12	M	µg/L	
PAFB03-MW01-N-110911	280-22645-2	SW8260B	Trichlorofluoromethane	0	UM	µg/L	
PAFB03-MW02-N-110911	280-22645-3	SW8260B	Trichlorofluoromethane	0.26	M	µg/L	
PAFB03-MW03-N-110911	280-22645-4	SW8260B	Trichlorofluoromethane	0	UM	µg/L	
PAFB03-MW04-N-110911	280-22645-5	SW8260B	Trichlorofluoromethane	0	UM	µg/L	
PAFB03-MW05-N-110911	280-22645-6	SW8260B	Trichlorofluoromethane	0	UM	µg/L	
PAFB03-MW05-FD-110911FD	280-22645-7	SW8260B	Trichlorofluoromethane	0	UM	µg/L	
PAFB03-MW06-N-111011	280-22704-1	SW8260B	Trichlorofluoromethane	0	UM	µg/L	

Analytical Data

Client: AECOM Technical Services Inc.

Job Number: 280-22704-1

Client Sample ID: PAFB07-MW03-N-111011

Lab Sample ID: 280-22704-2

Date Sampled: 11/10/2011 0905

Client Matrix: Water

Date Received: 11/11/2011 1000

6010B Metals (ICP)

Analysis Method:	6010B	Analysis Batch:	280-96871	Instrument ID:	MT_025
Prep Method:	3010A	Prep Batch:	280-96050	Lab File ID:	25A3111711.asc
Dilution:	1.0			Initial Weight/Volume:	50 mL
Analysis Date:	11/17/2011 1856			Final Weight/Volume:	50 mL
Prep Date:	11/17/2011 0615				

Analyte	Result (ug/L)	Qualifier	MDL	RL
Lead	34 <i>J</i>	Q	2.6	9.0

6010B Metals (ICP)-Dissolved

Analysis Method:	6010B	Analysis Batch:	280-96894	Instrument ID:	MT_026
Prep Method:	3005A	Prep Batch:	280-96033	Lab File ID:	26b111711.asc
Dilution:	1.0			Initial Weight/Volume:	50 mL
Analysis Date:	11/17/2011 2119			Final Weight/Volume:	50 mL
Prep Date:	11/17/2011 0615				

Analyte	Result (ug/L)	Qualifier	MDL	RL
Lead	2.6	U	2.6	25

2/21/12
Shelke

Analytical Data

Client: AECOM Technical Services Inc.

Job Number: 280-22704-1

Client Sample ID: PAFB07-MW01-N-111011

Lab Sample ID: 280-22704-3

Date Sampled: 11/10/2011 0820

Client Matrix: Water

Date Received: 11/11/2011 1000

6010B Metals (ICP)

Analysis Method:	6010B	Analysis Batch:	280-96871	Instrument ID:	MT_025
Prep Method:	3010A	Prep Batch:	280-96050	Lab File ID:	25A3111711.asc
Dilution:	1.0			Initial Weight/Volume:	50 mL
Analysis Date:	11/17/2011 1859			Final Weight/Volume:	50 mL
Prep Date:	11/17/2011 0615				

Analyte	Result (ug/L)	Qualifier	MDL	RL
Lead	16 J	Q	2.6	9.0

6010B Metals (ICP)-Dissolved

Analysis Method:	6010B	Analysis Batch:	280-96894	Instrument ID:	MT_026
Prep Method:	3005A	Prep Batch:	280-96033	Lab File ID:	26b111711.asc
Dilution:	1.0			Initial Weight/Volume:	50 mL
Analysis Date:	11/17/2011 2122			Final Weight/Volume:	50 mL
Prep Date:	11/17/2011 0615				

Analyte	Result (ug/L)	Qualifier	MDL	RL
Lead	2.6	U	2.6	25

2/21/12
KHP

Analytical Data

Client: AECOM Technical Services Inc.

Job Number: 280-22704-1

Client Sample ID: PAFB07-MW01-FD-111011

Lab Sample ID: 280-22704-4FD

Date Sampled: 11/10/2011 0820

Client Matrix: Water

Date Received: 11/11/2011 1000

6010B Metals (ICP)

Analysis Method:	6010B	Analysis Batch:	280-96871	Instrument ID:	MT_025
Prep Method:	3010A	Prep Batch:	280-96050	Lab File ID:	25A3111711.asc
Dilution:	1.0			Initial Weight/Volume:	50 mL
Analysis Date:	11/17/2011 1902			Final Weight/Volume:	50 mL
Prep Date:	11/17/2011 0615				

Analyte	Result (ug/L)	Qualifier	MDL	RL
Lead	34 <i>J</i>	Q	2.6	9.0

6010B Metals (ICP)-Dissolved

Analysis Method:	6010B	Analysis Batch:	280-96894	Instrument ID:	MT_026
Prep Method:	3005A	Prep Batch:	280-96033	Lab File ID:	26b111711.asc
Dilution:	1.0			Initial Weight/Volume:	50 mL
Analysis Date:	11/17/2011 2124			Final Weight/Volume:	50 mL
Prep Date:	11/17/2011 0615				

Analyte	Result (ug/L)	Qualifier	MDL	RL
Lead	2.6	U	2.6	25

2/21/12
afpe

DATA COMPLIANCE CHECK - TECHNICAL REVIEW
AECOM Technical Services
Test America Laboratories Inc, Denver CO, SDG 280-25094-1
AFCEE - Peterson Air Force Base, January 2012
Fourth Collection Quarter, Report date: 3/15/2012
Category 2 Review
Reviewer: Karen M. Munns

DATA VALIDATION SUMMARY:

Analytical quality was evaluated using the criteria specified in the Quality Assurance Project Plan (QAPP) Site Inspection Site 3 Peterson Air Force Base Colorado Springs, Colorado dated June 2008 and the Air Force Center for Environmental Excellence (AFCEE) Technical Services Quality Assurance Program, version 4.0.02, May 2006. Discussions of reviewed QC issues per performed methods below follow.

METHODS:

SW846 - 6020	Metals by Inductively Coupled Plasma – Mass Spectrometry (ICP-MS)
SW846 - 6010B	Metals by Inductively Coupled Plasma (ICP) Atomic Emission Spectrometry
SW846 - 8260B	Volatile Organic Compounds (VOCs) by Gas Chromatography (GC)/Mass Spectrometry (MS)
SM2320B	Alkalinity as Total, Carbonate and Bicarbonate
MCAWW 300.0	Anions by Ion Chromatography
SW846 9060A	Total Organic Carbon (TOC) by Flame Ionization Detection

SW846 = Test Methods for Evaluating Solid Waste, Physical/Chemical Methods

MCAWW = Methods for Chemical Analysis of Waters and Wastes, Environmental Protection Agency

SM = Standard Methods of Analysis

SAMPLES, LABORATORY ID, ALIQUOT, and MATRIX: See Table 1 at end of document.

DATA COMPLIANCE SUMMARY:

Based on the data compliance review, data for the above samples are:

_____	Acceptable for use
_____ X _____	Acceptable as qualified
_____	Some data unacceptable for use
_____	All data unacceptable for use

Sample Integrity

1. Samples were collected over 2-days, 1/26/2012 and 1/27/2012. The sample containers were received intact, within the temperature acceptance criteria of $\leq 6^{\circ}\text{C}$ (degrees Celsius), and properly preserved by both Federal Express and hand-delivery on 1/27/2012 at Test America Laboratories, Inc. in Arvada Colorado.
2. Dedicated sampling equipment was used and an equipment blank was not required.
3. The chain of custody forms (COCs) showed the incorrect site (PAFB07 rather than PAFB03) in one of the COC matrix spike (MS) and matrix spike duplicate (MSD) ID fields. The laboratory was directed to disregard this error, and a hand-corrected COC was scanned and sent to the lab for their records.

Method 6020, Total and Dissolved Metals by ICP-MS

1. The following QC items were evaluated: hold times, MBs, LCS %Rs, initial and continuing calibration verifications (ICVs, CCVs), RL check standard %Rs, and comparison of reported results to the raw data. All dissolved metals results were verified to be less than the total metals results within $\pm 2\text{x DL}$.
2. All samples were reported from a minimum of two analytical sets. Raw data associated with samples analyzed for one target were examined for other target (not reported metals) analyte concentrations in order to evaluate consistency and potential blanks effects.
3. The analyses of the ICSA interference check standard solution by Method 6020 show observed concentrations for cadmium ($0.4\mu\text{g/L}$) greater than 2 times the MDL ($2\text{x } 0.04\mu\text{g/L}$) associated with both total and dissolved metals analyses. The laboratory narrative indicated that the solution contained trace impurities and that the results are not due to matrix interference. Field sample concentrations were not equivalent to the interferents (aluminum, iron, molybdenum, and magnesium) concentrations in the ICSA standard, so the ICSA results do not apply to the field samples. No data qualifiers were assigned.
4. The dissolved metals method blank by method 6020 was analyzed in three different batches and the four target 6020 metals were not detected. The total metals method blank by method 6020 was analyzed in three different batches. Only thallium was detected at a concentration ($0.0360\mu\text{g/L}$) greater than the detection limit (DL) of $0.033\mu\text{g/L}$. In combination with the observed instrument blank detections, all total thallium sample results with detections less than the RL of $0.2\mu\text{g/L}$ were UB qualified, as not detected at the RL.
5. Selenium was not detected in the initial and continuing calibration blanks (ICBs and CCBs) associated with the samples.

Thallium was detected in the instrument blanks (ICBs and CCBs) associated with both total and dissolved metals samples. Instrument blank thallium concentrations ranged from $0.046\mu\text{g/L}$ to $0.060\mu\text{g/L}$. All sample detections less than the RL of $0.2\mu\text{g/L}$ were UB qualified, as not detected at the RL.

Antimony was detected in some instrument blanks (ICBs and CCBs) associated with both total and dissolved metals samples. The dissolved fraction samples were associated with both an ICB ($0.330\mu\text{g/L}$) and CCB ($0.366\mu\text{g/L}$) with observed antimony detections. All dissolved antimony detections less than the RL were UB qualified with one exception. Based on professional judgment (and observation of numerous analyses) the dissolved antimony concentration ($0.94\mu\text{g/L}$) in lab sample -7 (PAFB03-MW06-N012612) was J qualified as estimated because it was less than the RL of $1.0\mu\text{g/L}$, but not B qualified. The total and dissolved antimony raw data results for numerous analyses of lab sample -7 indicate that the detected concentrations are not contamination artifacts. Antimony was detected in the ICB associated with the total metals samples, however was not detected in the method blank or bracketing CCBs (analyzed 3 hours later). The total antimony samples were not qualified as a result of instrument blank detections. See Table 3 at the end of this document for a summary of the applied qualifiers.

Cadmium was detected in some instrument blanks (CCBs) associated with both total and dissolved metals samples. Sample associations to the blank detections were evaluated. The CCB detection for cadmium (0.069µg/L) was associated with two dissolved samples: PAFB03-MW04-N-012612 (lab ID -4) and PAFB03-MW05-FD-012612 (lab ID -6). Both sample cadmium results were UB qualified as not detected at the RL. Total metals samples lab IDs -4 through -7 were associated with a CCB detection for cadmium (0.057µg/L). Results less than 5x the blank detection (or less than 0.3µg/L) were UB qualified as not detected. See Table 3 at the end of this document for a summary of the applied data qualifiers.

6. A field duplicate sample pair was collected from PAFB03-MW05 (280-25094-5 and 280-25094-6) for total and dissolved metals. The detected results are provided in Table 2 at the end of this document. When results were greater than the RL, an RPD was calculated. If one or both detected results are less than the RL, the acceptance was evaluated qualitatively. The field duplicate pair results met criteria.
7. The serial dilution and PDS analyses were performed on the total metals samples from PAFB03-MW02-N-012612 (280-25094-2) for cadmium, and PAFB03-MW03-N-012612 (280-25094-3) for antimony, selenium, and thallium. The serial dilution was performed on the dissolved fraction samples PAFB03-MW04-N-012612 (280-25094-4) for cadmium, and PAFB03-MW03-N-012612 (280-25094-3) for antimony, selenium, and thallium. Metals concentrations were not greater than 50x the DL, and the serial dilution results did not apply. PDS %Rs for total and dissolved metals were within the 75 - 125% criteria, and qualification was not required.
8. The total and dissolved metals MS/MSD were performed on samples PAFB03-MW03-N-012612 (280-25094-3) and PAFB03-MW04-N-012612 (280-25094-4). All total and dissolved metals %Rs and RPDs were within control limits with the exception of total antimony (dissolved antimony met criteria). Total antimony was recovered at 75% and 72% in the MS and MSD (respectively) performed on lab ID -3, and at 61% and 63% in the MS and MSD (respectively) performed on lab ID -4; both MS/MSD pairs recovered less than the 80 - 120% criteria. (The PDS met criteria indicating a matrix effect during sample digestion). The method citation used for the Method 6020 sample digestion (SW-846 3020A) does not include antimony in the list of acceptable metals. All total antimony sample results were M qualified due to the observed matrix effects, the bias is potentially low.

Method 6010B total and dissolved

1. The following QC items were evaluated and verified to meet criteria: hold times, LCS %Rs, ICVs, CCVs, RL check standard %Rs, MS/MSD %Rs and RPDs, and comparison of reported results to the raw data. All dissolved metals results were verified to be less than or equal to the total metals results for each sample.
2. Target metals were not detected in the MB associated with the dissolved metals, and no metals detections were observed in the total metals MB with the following exceptions: calcium (53.4µg/L), nickel (2.27µg/L), sodium (193 µg/L), and zinc (7.90 µg/L). All total metals MB detected concentrations were less than the associated RL. Associated 'total' metals samples had observed detections much greater than the RL for calcium, sodium, and zinc. Nickel was UB qualified as not detected in the total metals samples with less than RL detections. See Table 3 at the end of this document for a summary of applied data qualifiers.
3. Total and dissolved metals were analyzed in a single analytical set. Arsenic was detected (5.65µg/L) at a concentration less than the RL (30µg/L) in the initial calibration blank (ICB) analyzed 2/2/12 at 0937. However, because associated sample analyses were performed over four hours later from 1325 to 1529, and arsenic was not detected in any associated continuing calibration blanks (CCBs) or method blanks, samples were not qualified due to the ICB arsenic result.
4. The analysis of the ICSA interference check standard solution by Method 6010B shows concentrations for chromium and copper at levels greater than 2 times the MDL for both total and dissolved metals analyses.

The laboratory narrative indicates that the solution contained trace impurities and that the results are not due to matrix interference. In addition, field sample concentrations were not equivalent to the interferent (aluminum, iron, calcium, and magnesium) concentrations in the ICSA standard. No data qualifiers were assigned.

5. Sample location duplicate sample pair was collected from PAFB03-MW05 (280-25094-5 and 280-25094-6) for total and dissolved metals, and from PAFB07-MW03 (280-25094-9 and 280-25094-10) for total and dissolved lead. The detected results are provided in Table 2 at the end of this document. When results were greater than the RL, an RPD was calculated. If one or both detected results are less than the RL, the acceptance was evaluated qualitatively. The field duplicate pair results met criteria.
6. The serial dilution (DL) and PDS analyses were performed on both the total and dissolved metals samples from PAFB03-MW03-N-012612 (280-25094-3). The serial dilution percent difference (%D) evaluation criteria of $\leq 10\%$ applies to undiluted sample concentrations greater than 50x the MDL. The PDS was performed to evaluate matrix effect to all other target metals concentrations.

Professional judgment determines that in some cases the 50x MDL concentration multiplier for DL evaluation may not be appropriate when the MDL to RL multiplier is greater than 50x. For example: the undiluted barium observed concentration ($160\mu\text{g/L}$) was $> 50\text{x}$ the MDL of $0.058\mu\text{g/L}$. However, because barium's RL is $50\mu\text{g/L}$ (or $250\mu\text{g/L}$ RL at 5x) the expected 5x concentration would be less than the RL, and by definition an estimated concentration. Therefore, in this case, the DL evaluation applies when the undiluted concentration is greater than 5x the diluted RL, and the determined barium %D of 15% does not apply. Applicable serial dilution %Ds and all other metals PDS %Rs were in control. Qualification was not required.

7. The total and dissolved metals MS/MSDs were performed on samples PAFB03-MW03-N-012612 (280-25094-3) and PAFB03-MW04-N-012612 (280-25094-4). All total and dissolved metals %Rs and RPDs were within control limits and qualification was not required.

Method 8260B VOCs

1. The following QC items were evaluated and met criteria: initial calibration (ICAL), second source calibration verification standard (SSCV), continuing calibration verification standard (CCV), GC/MS tunes, and internal standard area counts and retention times, holding times, surrogate %Rs, and LCS %Rs.
2. Samples were unpreserved and the analyses were performed within the hold time of 7 days from collection to analysis.
3. All VOC samples were analyzed undiluted, reporting limits met QAPP criteria.
4. VOCs were not detected in the associated MB with the exception of methylene chloride at a concentration of $0.435\mu\text{g/L}$, less than the RL of $2.0\mu\text{g/L}$. All samples were analyzed in a single analytical batch. Methylene chloride was detected at similar concentration in the associated samples and detections less than the RL were UB qualified, as not detected at the RL.
5. A trip blank was not associated with either sample collection date. Because no samples required dilution for VOCs analysis, sample concentration can be expected to have a minimal effect if any from potential cross-contamination. Because any detections as a result from cross-contamination would be expected to be at concentrations less than the RL which are already J qualified as estimated, additional qualifiers are not applied to the data. Any effect to data usability due to the missing trip blank samples is expected to be insignificant.

- A VOC field duplicate sample pair was collected from PAFB03-MW05 (280-25094-5 and 280-25094-6). The results are provided in Table 2 at the end of this document. All VOC detected results agreed within the QAPP-specified $\leq 20\%$ RPD. No qualifiers were applied as a result of the FD samples.
- A MS/MSD was analyzed from site PAFB03-MW04. All target analyte %Rs and RPDs were within the DoD QSM criteria with the exceptions summarized below. High recoveries and RPD outliers only affect detected sample results. No associated detections were observed, data qualifiers were not required.

MS/SD Parent Field ID (Lab ID)	Outlier Target	%Rs (RPD)	Criteria %R (RPD)	Action
PAFB03-MW04-N- 012612 (280-25094-4)	1,1-Dichloroethylene	128 / 131 (2)	68 - 130 (2)	None - No associated detections.
	Acetone	86 / 107 (23)	40 - 135 (20)	

Method 300.0 – Major Anions

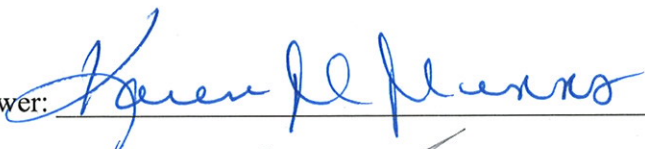
- The following QC items were evaluated and met criteria: ICAL, ICB, CCBs, ICV, CCVs, MBs, LCS/LCSD %Rs and RPDs, and laboratory duplicate RPDs.
- All appropriate holding times were met for sample analysis. Nitrate/nitrite analyses were performed within 48-hours of sample collection, and all other anions were analyzed within 28-days of collection.
- MS and MSD analyses were performed on samples PAFB03-MW03-N-012612 (280-25094-3) and PAFB03-MW04-N-012612 (280-25094-4). MS and MSD %Rs were within QAPP-specified 85 - 115% recovery control criteria, and RPDs were within $\leq 20\%$. Sample qualification was not necessary.
- A field duplicate sample pair was collected from PAFB03-MW05 (280-25094-5 and 280-25094-6). Detected results are detailed in Table 2 at the end of the document. Calculated RPDs were less than the control criteria of 20% and data qualifiers were not required.
- Sample PAFB03-MW-03-N-012612 (280-25094-3) was analyzed at a dilution for nitrate as nitrogen in order to analyze the concentration within the calibrated range. The reporting limit was raised accordingly. No sample qualification was necessary.


Method SM2320 Total, Carbonate, and Bicarbonate Alkalinity

- The following QC items were performed, evaluated, and met criteria: holding times. Per the QAPP, alkalinity data are defined as screening quality data and required QC is collecting a field duplicate at a 10% frequency. LCS, and MS/MSD analyses are not performed with the samples.
- Bicarbonate alkalinity was detected in the method blanks at concentrations less than the RL of 5mg/L. Bicarbonate alkalinity was detected at concentrations greater than the RL in the associated samples and qualification was not required.
- The analytical method specified in the QAPP was EPA 310.1. The analytical method reported as being used in the data package was SM2320B. No action was required due to this change.
- A field duplicate sample pair was collected from PAFB03-MW05 (280-25094-5 and 280-25094-6). The results are provided in Table 2 at the end of this document. Carbonate was not detected in either sample. Bicarbonate alkalinity was detected in both samples greater than the RL, and the calculated RPD met the $\leq 20\%$ RPD QC acceptance criteria. Data qualification is not required.

Method 9060 Total Organic Carbon

1. The following QC items were evaluated and met criteria: holding times, MBs, ICAL, ICB, ICVs, CCBs, CCVs, MBs, LCS/LCSD %Rs and RPDs, .
2. TOC MS and MSD analyses were performed on samples PAFB03-MW03-N-012612 (280-25094-3) and PAFB03-MW04-N-012612 (280-25094-4). %Rs and RPDs were within control criteria and sample qualification was not necessary.
3. A laboratory duplicate was not performed in either SDG for this method, and an assessment could not be made. However, since the LCS/LCSD RPD and MS/MSD RPD were within criteria, laboratory precision was met and data usability was not affected.
4. A field duplicate sample pair was collected from PAFB03-MW05 (280-25094-5 and 280-25094-6). The results are provided in Table 2 at the end of this document. The calculated RPD was within the control criteria of $\leq 20\%$. No qualifiers were applied.

Reviewer:  Date: 3/16/2012

QC Reviewer:  Date: 3-19-12

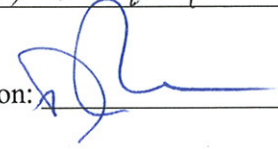
Database Entry Person:  Date: 4/6/2012

TABLE 1
SAMPLES COLLECTED
Peterson Air Force Base, January 2012
Fourth Collection Quarter
TestAmerica Laboratories Inc., Denver, CO

Field ID	Location	Lab ID	Sample Type	Date & Time Collected		Analytical Method
PAFB03-MW01-N-012712	PAFB03-MW01	280-25094-1	N	27-Jan-2012	1040	A2320
PAFB03-MW01-N-012712	PAFB03-MW01	280-25094-1	N	27-Jan-2012	1040	E300
PAFB03-MW01-N-012712	PAFB03-MW01	280-25094-1	N	27-Jan-2012	1040	SW6010B
PAFB03-MW01-N-012712	PAFB03-MW01	280-25094-1	N	27-Jan-2012	1040	SW6020
PAFB03-MW01-N-012712	PAFB03-MW01	280-25094-1	N	27-Jan-2012	1040	SW8260B
PAFB03-MW01-N-012712	PAFB03-MW01	280-25094-1	N	27-Jan-2012	1040	SW9060
PAFB03-MW02-N-012612	PAFB03-MW02	280-25094-2	N	26-Jan-2012	1240	A2320
PAFB03-MW02-N-012612	PAFB03-MW02	280-25094-2	N	26-Jan-2012	1240	E300
PAFB03-MW02-N-012612	PAFB03-MW02	280-25094-2	N	26-Jan-2012	1240	SW6010B
PAFB03-MW02-N-012612	PAFB03-MW02	280-25094-2	N	26-Jan-2012	1240	SW6020
PAFB03-MW02-N-012612	PAFB03-MW02	280-25094-2	N	26-Jan-2012	1240	SW8260B
PAFB03-MW02-N-012612	PAFB03-MW02	280-25094-2	N	26-Jan-2012	1240	SW9060
PAFB03-MW03-N-012612	PAFB03-MW03	280-25094-3	N	26-Jan-2012	1400	A2320
PAFB03-MW03-N-012612	PAFB03-MW03	280-25094-3	N	26-Jan-2012	1400	E300
PAFB03-MW03-N-012612	PAFB03-MW03	280-25094-3	N	26-Jan-2012	1400	SW6010B
PAFB03-MW03-N-012612	PAFB03-MW03	280-25094-3	N	26-Jan-2012	1400	SW6020
PAFB03-MW03-N-012612	PAFB03-MW03	280-25094-3	N	26-Jan-2012	1400	SW8260B
PAFB03-MW03-N-012612	PAFB03-MW03	280-25094-3	N	26-Jan-2012	1400	SW9060
PAFB03-MW03-N-012612MS	PAFB03-MW03	280-25094-3MS	MS	26-Jan-2012	1400	E300
PAFB03-MW03-N-012612MS	PAFB03-MW03	280-25094-3MS	MS	26-Jan-2012	1400	SW6010B
PAFB03-MW03-N-012612MS	PAFB03-MW03	280-25094-3MS	MS	26-Jan-2012	1400	SW6020
PAFB03-MW03-N-012612MS	PAFB03-MW03	280-25094-3MS	MS	26-Jan-2012	1400	SW8260B
PAFB03-MW03-N-012612MS	PAFB03-MW03	280-25094-3MS	MS	26-Jan-2012	1400	SW9060
PAFB03-MW03-N-012612SD	PAFB03-MW03	280-25094-3SD	SD	26-Jan-2012	1400	E300
PAFB03-MW03-N-012612SD	PAFB03-MW03	280-25094-3SD	SD	26-Jan-2012	1400	SW6010B
PAFB03-MW03-N-012612SD	PAFB03-MW03	280-25094-3SD	SD	26-Jan-2012	1400	SW6020
PAFB03-MW03-N-012612SD	PAFB03-MW03	280-25094-3SD	SD	26-Jan-2012	1400	SW8260B
PAFB03-MW03-N-012612SD	PAFB03-MW03	280-25094-3SD	SD	26-Jan-2012	1400	SW9060
PAFB03-MW04-N-012612	PAFB03-MW04	280-25094-4	N	26-Jan-2012	1305	A2320
PAFB03-MW04-N-012612	PAFB03-MW04	280-25094-4	N	26-Jan-2012	1305	E300
PAFB03-MW04-N-012612	PAFB03-MW04	280-25094-4	N	26-Jan-2012	1305	SW6010B
PAFB03-MW04-N-012612	PAFB03-MW04	280-25094-4	N	26-Jan-2012	1305	SW6020
PAFB03-MW04-N-012612	PAFB03-MW04	280-25094-4	N	26-Jan-2012	1305	SW8260B
PAFB03-MW04-N-012612	PAFB03-MW04	280-25094-4	N	26-Jan-2012	1305	SW9060
PAFB03-MW04-N-012612MS	PAFB03-MW04	280-25094-4MS	MS	26-Jan-2012	1305	E300
PAFB03-MW04-N-012612MS	PAFB03-MW04	280-25094-4MS	MS	26-Jan-2012	1305	SW6010B
PAFB03-MW04-N-012612MS	PAFB03-MW04	280-25094-4MS	MS	26-Jan-2012	1305	SW6020
PAFB03-MW04-N-012612MS	PAFB03-MW04	280-25094-4MS	MS	26-Jan-2012	1305	SW8260B
PAFB03-MW04-N-012612MS	PAFB03-MW04	280-25094-4MS	MS	26-Jan-2012	1305	SW9060
PAFB03-MW04-N-012612SD	PAFB03-MW04	280-25094-4SD	SD	26-Jan-2012	1305	E300
PAFB03-MW04-N-012612SD	PAFB03-MW04	280-25094-4SD	SD	26-Jan-2012	1305	SW6010B
PAFB03-MW04-N-012612SD	PAFB03-MW04	280-25094-4SD	SD	26-Jan-2012	1305	SW6020

TABLE 1
SAMPLES COLLECTED
Peterson Air Force Base, January 2012
Fourth Collection Quarter
TestAmerica Laboratories Inc., Denver, CO

Field ID	Location	Lab ID	Sample Type	Date & Time Collected		Analytical Method
PAFB03-MW04-N-012612SD	PAFB03-MW04	280-25094-4SD	SD	26-Jan-2012	1305	SW8260B
PAFB03-MW04-N-012612SD	PAFB03-MW04	280-25094-4SD	SD	26-Jan-2012	1305	SW9060
PAFB03-MW05-N-012612	PAFB03-MW05	280-25094-5	N	26-Jan-2012	1145	A2320
PAFB03-MW05-N-012612	PAFB03-MW05	280-25094-5	N	26-Jan-2012	1145	E300
PAFB03-MW05-N-012612	PAFB03-MW05	280-25094-5	N	26-Jan-2012	1145	SW6010B
PAFB03-MW05-N-012612	PAFB03-MW05	280-25094-5	N	26-Jan-2012	1145	SW6020
PAFB03-MW05-N-012612	PAFB03-MW05	280-25094-5	N	26-Jan-2012	1145	SW8260B
PAFB03-MW05-N-012612	PAFB03-MW05	280-25094-5	N	26-Jan-2012	1145	SW9060
PAFB03-MW05-FD-012612FD	PAFB03-MW05	280-25094-6FD	FD	26-Jan-2012	1145	A2320
PAFB03-MW05-FD-012612FD	PAFB03-MW05	280-25094-6FD	FD	26-Jan-2012	1145	E300
PAFB03-MW05-FD-012612FD	PAFB03-MW05	280-25094-6FD	FD	26-Jan-2012	1145	SW6010B
PAFB03-MW05-FD-012612FD	PAFB03-MW05	280-25094-6FD	FD	26-Jan-2012	1145	SW6020
PAFB03-MW05-FD-012612FD	PAFB03-MW05	280-25094-6FD	FD	26-Jan-2012	1145	SW8260B
PAFB03-MW05-FD-012612FD	PAFB03-MW05	280-25094-6FD	FD	26-Jan-2012	1145	SW9060
PAFB03-MW06-N-012612	PAFB03-MW06	280-25094-7	N	26-Jan-2012	1100	A2320
PAFB03-MW06-N-012612	PAFB03-MW06	280-25094-7	N	26-Jan-2012	1100	E300
PAFB03-MW06-N-012612	PAFB03-MW06	280-25094-7	N	26-Jan-2012	1100	SW6010B
PAFB03-MW06-N-012612	PAFB03-MW06	280-25094-7	N	26-Jan-2012	1100	SW6020
PAFB03-MW06-N-012612	PAFB03-MW06	280-25094-7	N	26-Jan-2012	1100	SW8260B
PAFB03-MW06-N-012612	PAFB03-MW06	280-25094-7	N	26-Jan-2012	1100	SW9060
PAFB07-MW01-N-012712	PAFB07-MW01	280-25094-8	N	27-Jan-2012	1145	SW6010B
PAFB07-MW03-N-012712	PAFB07-MW03	280-25094-9	N	27-Jan-2012	1130	SW6010B
PAFB07-MW03-FD-012712FD	PAFB07-MW03	280-25094-10FD	FD	27-Jan-2012	1130	SW6010B

FD = Field duplicate

N = Normal investigative sample

MS = Matrix spike

SD = MS Duplicate

Table 2
Field Duplicate Sample Pair Results

Parent Field ID (Lab ID)	FD Field ID (Lab ID)	Method	Target	Parent Result	FD Result	Units	RL	RPD (%)
PAFB03-MW05-N-012612 280-25094-5	PAFB03-MW05-FD-012612 280-25094-6	A2320	Alkalinity, Bicarbonate	460	460	mg/L	-	0
		E300	Chloride	42	43	mg/L	3	2
		E300	Nitrate as Nitrogen	7.1	7.1	mg/L	0.5	0
		E300	Sulfate (as SO4)	25	25	mg/L	5	0
		SW6010B	Barium (Diss)	140	140	µg/L	50	0
		SW6010B	Calcium (Diss)	140000	140000	µg/L	1100	0
		SW6010B	Magnesium (Diss)	20000	21000	µg/L	1000	5
		SW6010B	Nickel (Diss)	2.1 J	2.5 J	µg/L	20	na
		SW6010B	Potassium (Diss)	2600	3000	µg/L	1000	14
		SW6010B	Sodium (Diss)	46000	47000	µg/L	1000	2
		SW6010B	Zinc (Diss)	4.8 J	4.9 J	µg/L	20	na
		SW6010B	Arsenic	10 J	16 J	µg/L	30	na
		SW6010B	Barium	330	360	µg/L	50	9
		SW6010B	Beryllium	1.4 J	1.7 J	µg/L	4	na
		SW6010B	Calcium	150000	150000	µg/L	1100	0
		SW6010B	Chromium	32	37	µg/L	10	14
		SW6010B	Cobalt	13 J	15 J	µg/L	60	na
		SW6010B	Copper	22	26	µg/L	10	17
		SW6010B	Lead	26	28	µg/L	25	7
		SW6010B	Magnesium	27000	27000	µg/L	1000	0
		SW6010B	Nickel	20	24	µg/L	20	18
		SW6010B	Potassium	6400	7200	µg/L	1000	12
		SW6010B	Sodium	47000	46000	µg/L	1000	2
		SW6010B	Vanadium	52	62	µg/L	10	18
		SW6010B	Zinc	100	110	µg/L	20	10
		SW6020	Cadmium (Diss)	U	0.17 J	µg/L	2	na
		SW6020	Selenium (Diss)	1.5 J	1.4 J	µg/L	2	na
		SW6020	Thallium (Diss)	0.046 J	0.046 J	µg/L	0.2	na
		SW6020	Antimony	U	0.25 J	µg/L	1	na

Table 2
Field Duplicate Sample Pair Results

Parent Field ID (Lab ID)	FD Field ID (Lab ID)	Method	Target	Parent Result	FD Result	Units	RL	RPD (%)
PAFB03-MW05-N-012612 280-25094-5 continued	PAFB03-MW05-FD-012612 280-25094-6 continued	SW6020	Cadmium	0.18 J	0.27 J	µg/L	2	na
		SW6020	Selenium	2	1.9 J	µg/L	2	na
		SW6020	Thallium	0.38	0.45	µg/L	0.2	17
		SW8260B	1,1,1-Trichloroethane	0.14 J	0.14 J	µg/L	1	na
		SW8260B	1,1,2-Trichloroethane	0.19 J	0.2 J	µg/L	1	na
		SW8260B	1,1-Dichloroethane	4	4.1	µg/L	1	2
		SW8260B	1,2-Dichloropropane	2.4	2.5	µg/L	1	4
		SW8260B	1,4-Dichlorobenzene	0.16 J	0.12 J	µg/L	0.5	na
		SW8260B	Chloroform	0.42	0.43	µg/L	0.3	2
		SW8260B	cis-1,2-Dichloroethylene	1.4	1.5	µg/L	1	7
		SW8260B	Dichloromethane	1.2 J	1.3 J	µg/L	2	na
		SW8260B	Tetrachloroethene	1.9	2	µg/L	1	5
		SW8260B	Trichloroethene (TCE)	0.79 J	0.83 J	µg/L	1	na
		SW9060	Total Organic Carbon	1.7	1.7	µg/L	1	0
PAFB07-MW03-N-012712 280-25094-9	PAFB07-MW03-FD-012712 280-25094-10	SW6010B	Lead	27	23	µg/L	9	16

Table 3
Qualified Data Summary

Field Sample ID	Laboratory ID	Test Method	Target Analyte	Result	Applied Flags	Units	Reason
PAFB03-MW01-N-012712	280-25094-1	SW8260B	Dichloromethane	0.42	UB	µg/L	Laboratory Method Blank Detection
PAFB03-MW02-N-012612	280-25094-2	SW8260B	Dichloromethane	0.45	UB	µg/L	
PAFB03-MW03-N-012612	280-25094-3	SW8260B	Dichloromethane	0.42	UB	µg/L	
PAFB03-MW04-N-012612	280-25094-4	SW8260B	Dichloromethane	0.47	UB	µg/L	
PAFB03-MW05-N-012612	280-25094-5	SW8260B	Dichloromethane	1.2	UB	µg/L	
PAFB03-MW05-FD-012612FD	280-25094-6FD	SW8260B	Dichloromethane	1.3	UB	µg/L	
PAFB03-MW06-N-012612	280-25094-7	SW8260B	Dichloromethane	0.47	UB	µg/L	Instrument Blank Detections
PAFB03-MW01-N-012712	280-25094-1	SW6020	Antimony (Diss)	0.28	UB	µg/L	
PAFB03-MW02-N-012612	280-25094-2	SW6020	Antimony (Diss)	0.2	UB	µg/L	
PAFB03-MW03-N-012612	280-25094-3	SW6020	Antimony (Diss)	0.39	UB	µg/L	
PAFB03-MW04-N-012612	280-25094-4	SW6020	Antimony (Diss)	0.27	UB	µg/L	Less than RL
PAFB03-MW06-N-012612	280-25094-7	SW6020	Antimony (Diss)	0.94	J	µg/L	
PAFB03-MW01-N-012712	280-25094-1	SW6020	Antimony (Tot)	0.48	M	µg/L	Low MS / MSD Recoveries
PAFB03-MW02-N-012612	280-25094-2	SW6020	Antimony (Tot)	0.2	M	µg/L	
PAFB03-MW03-N-012612	280-25094-3	SW6020	Antimony (Tot)	0.42	M	µg/L	
PAFB03-MW04-N-012612	280-25094-4	SW6020	Antimony (Tot)	U	M	µg/L	
PAFB03-MW05-N-012612	280-25094-5	SW6020	Antimony (Tot)	U	M	µg/L	
PAFB03-MW05-FD-012612FD	280-25094-6FD	SW6020	Antimony (Tot)	0.25	M	µg/L	
PAFB03-MW06-N-012612	280-25094-7	SW6020	Antimony (Tot)	0.64	M	µg/L	Instrument Blank Detections
PAFB03-MW04-N-012612	280-25094-4	SW6020	Cadmium (Diss)	0.043	UB	µg/L	
PAFB03-MW05-FD-012612FD	280-25094-6FD	SW6020	Cadmium (Diss)	0.17	UB	µg/L	
PAFB03-MW05-N-012612	280-25094-5	SW6020	Cadmium (Tot)	0.18	UB	µg/L	
PAFB03-MW05-FD-012612FD	280-25094-6FD	SW6020	Cadmium (Tot)	0.27	UB	µg/L	Instrument and Method Blank Detections
PAFB03-MW01-N-012712	280-25094-1	SW6020	Thallium (Diss)	0.059	UB	µg/L	
PAFB03-MW03-N-012612	280-25094-3	SW6020	Thallium (Diss)	0.034	UB	µg/L	
PAFB03-MW05-N-012612	280-25094-5	SW6020	Thallium (Diss)	0.046	UB	µg/L	
PAFB03-MW05-FD-012612FD	280-25094-6FD	SW6020	Thallium (Diss)	0.046	UB	µg/L	
PAFB03-MW06-N-012612	280-25094-7	SW6020	Thallium (Diss)	0.037	UB	µg/L	
PAFB03-MW03-N-012612	280-25094-3	SW6020	Thallium (Tot)	0.16	UB	µg/L	
PAFB03-MW04-N-012612	280-25094-4	SW6020	Thallium (Tot)	0.19	UB	µg/L	
PAFB03-MW03-N-012612	280-25094-3	SW6010B	Nickel (Tot)	8.9	UB	µg/L	Method Blank Detections
PAFB03-MW04-N-012612	280-25094-4	SW6010B	Nickel (Tot)	9.4	UB	µg/L	

Analytical Data

Client: AECOM Technical Services Inc.

Job Number: 280-25094-1

Client Sample ID: PAFB07-MW01-N-012712

Lab Sample ID: 280-25094-8

Date Sampled: 01/27/2012 1145

Client Matrix: Water

Date Received: 01/27/2012 1500

6010B Metals (ICP)

Analysis Method: 6010B

Analysis Batch: 280-106113

Instrument ID: MT_025

Prep Method: 3010A

Prep Batch: 280-105528

Lab File ID: 25A020212.asc

Dilution: 1.0

Initial Weight/Volume: 50 mL

Analysis Date: 02/02/2012 1418

Final Weight/Volume: 50 mL

Prep Date: 02/02/2012 0645

Analyte	Result (ug/L)	Qualifier	MDL	RL
Lead	28		2.6	9.0

6010B Metals (ICP)-Dissolved

Analysis Method: 6010B

Analysis Batch: 280-106115

Instrument ID: MT_025

Prep Method: 3005A

Prep Batch: 280-105545

Lab File ID: 25B020212.asc

Dilution: 1.0

Initial Weight/Volume: 50 mL

Analysis Date: 02/02/2012 1518

Final Weight/Volume: 50 mL

Prep Date: 02/02/2012 0645

Analyte	Result (ug/L)	Qualifier	MDL	RL
Lead	2.6	U	2.6	25

3/15/12
Kup

Analytical Data

Client: AECOM Technical Services Inc.

Job Number: 280-25094-1

Client Sample ID: PAFB07-MW03-N-012712

Lab Sample ID: 280-25094-9

Date Sampled: 01/27/2012 1130

Client Matrix: Water

Date Received: 01/27/2012 1500

6010B Metals (ICP)

Analysis Method:	6010B	Analysis Batch:	280-106113	Instrument ID:	MT_025
Prep Method:	3010A	Prep Batch:	280-105528	Lab File ID:	25A020212.asc
Dilution:	1.0			Initial Weight/Volume:	50 mL
Analysis Date:	02/02/2012 1420			Final Weight/Volume:	50 mL
Prep Date:	02/02/2012 0645				

Analyte	Result (ug/L)	Qualifier	MDL	RL
Lead	27		2.6	9.0

6010B Metals (ICP)-Dissolved

Analysis Method:	6010B	Analysis Batch:	280-106115	Instrument ID:	MT_025
Prep Method:	3005A	Prep Batch:	280-105545	Lab File ID:	25B020212.asc
Dilution:	1.0			Initial Weight/Volume:	50 mL
Analysis Date:	02/02/2012 1520			Final Weight/Volume:	50 mL
Prep Date:	02/02/2012 0645				

Analyte	Result (ug/L)	Qualifier	MDL	RL
Lead	2.6	U	2.6	25

3/15/12
LH

Analytical Data

Client: AECOM Technical Services Inc.

Job Number: 280-25094-1

Client Sample ID: PAFB07-MW03-FD-012712

Lab Sample ID: 280-25094-10FD

Date Sampled: 01/27/2012 1130

Client Matrix: Water

Date Received: 01/27/2012 1500

6010B Metals (ICP)

Analysis Method:	6010B	Analysis Batch:	280-106113	Instrument ID:	MT_025
Prep Method:	3010A	Prep Batch:	280-105528	Lab File ID:	25A020212.asc
Dilution:	1.0			Initial Weight/Volume:	50 mL
Analysis Date:	02/02/2012 1422			Final Weight/Volume:	50 mL
Prep Date:	02/02/2012 0645				

Analyte	Result (ug/L)	Qualifier	MDL	RL
Lead	23		2.6	9.0

6010B Metals (ICP)-Dissolved

Analysis Method:	6010B	Analysis Batch:	280-106115	Instrument ID:	MT_025
Prep Method:	3005A	Prep Batch:	280-105545	Lab File ID:	25B020212.asc
Dilution:	1.0			Initial Weight/Volume:	50 mL
Analysis Date:	02/02/2012 1522			Final Weight/Volume:	50 mL
Prep Date:	02/02/2012 0645				

Analyte	Result (ug/L)	Qualifier	MDL	RL
Lead	2.6	U	2.6	25

3/15/12
KJH

DATA COMPLIANCE CHECK - TECHNICAL REVIEW
AECOM Technical Services
Test America Laboratories Inc, Denver CO, SDGs 280-18532-1 and 280-18587 (QC set)
AFCEE - Peterson AFB 2nd Quarter Sampling 2011
Report date: 9/14/2011
Category 2 Review
Reviewers: Steve Szocik and Becki Sheridan

DATA VALIDATION SUMMARY:

Analytical quality was evaluated using the criteria specified in the Quality Assurance Project Plan (QAPP) Site Inspection Site 3 Peterson Air Force Base Colorado Springs, Colorado dated June 2008 and the Air Force Center for Environmental Excellence (AFCEE) Technical Services Quality Assurance Program, version 4.0.02, May 2006. Discussions of reviewed QC issues per method follow.

METHODS:

SW846 - 6020	Metals by Inductively Coupled Plasma – Mass Spectrometry (ICP-MS)
SW846 - 6010B	Metals by Inductively Coupled Plasma (ICP) Atomic Emission Spectrometry
SW846 - 8260B	Volatile Organic Compounds (VOCs) by Gas Chromatography (GC)/Mass Spectrometry (MS)
SM2320B	Alkalinity as Carbonate and Bicarbonate
MCAWW 300	Anions by Ion Chromatography
SW846 9060A	Total Organic Carbon (TOC) by Flame Ionization Detection

SW846 = Test Methods for Evaluating Solid Waste, Physical/Chemical Methods

MCAWW = Methods for Chemical Analysis of Waters and Wastes, Environmental Protection Agency

SM = Standard Methods of Analysis, 18th Edition

SAMPLE NUMBER: 280-18532 4 groundwater samples, 1 field duplicate (FD) and one trip blank.
280-18587 4 groundwater samples, 1 field duplicate (FD), 1 matrix spike (MS) and spike duplicate (MSD) and one trip blank.

SAMPLES, LABORATORY ID, ALIQUOT, and MATRIX:

Field ID	Location	280-18532 Lab ID	Sample Type	Date & Time Collected		Analytical Method
PAFB03-MW02-N-07272011	PAFB03-MW02	280-18532-1	N	27-Jul-2011	1320	A2320
PAFB03-MW02-N-07272011	PAFB03-MW02	280-18532-1	N	27-Jul-2011	1320	E300
PAFB03-MW02-N-07272011	PAFB03-MW02	280-18532-1	N	27-Jul-2011	1320	SW6010B
PAFB03-MW02-N-07272011	PAFB03-MW02	280-18532-1	N	27-Jul-2011	1320	SW6020
PAFB03-MW02-N-07272011	PAFB03-MW02	280-18532-1	N	27-Jul-2011	1320	SW8260B
PAFB03-MW02-N-07272011	PAFB03-MW02	280-18532-1	N	27-Jul-2011	1320	SW9060
PAFB03-MW05-N-07272011	PAFB03-MW05	280-18532-2	N	27-Jul-2011	1530	A2320
PAFB03-MW05-N-07272011	PAFB03-MW05	280-18532-2	N	27-Jul-2011	1530	E300
PAFB03-MW05-N-07272011	PAFB03-MW05	280-18532-2	N	27-Jul-2011	1530	SW6010B
PAFB03-MW05-N-07272011	PAFB03-MW05	280-18532-2	N	27-Jul-2011	1530	SW6020
PAFB03-MW05-N-07272011	PAFB03-MW05	280-18532-2	N	27-Jul-2011	1530	SW8260B
PAFB03-MW05-N-07272011	PAFB03-MW05	280-18532-2	N	27-Jul-2011	1530	SW9060
PAFB07-MW01-N-07272011	PAFB07-MW01	280-18532-3	N	27-Jul-2011	1220	SW6010B
PAFB07-MW03-N-07272011	PAFB07-MW03	280-18532-4	N	27-Jul-2011	1100	SW6010B
PAFB07-MW03-FD-07272011FD	PAFB07-MW03	280-18532-5	FD	27-Jul-2011	1100	SW6010B
PAFB-TRIP-TB-07272011	FIELDQC	280-18532-6	TB	27-Jul-2011	0000	SW8260B

Field ID	Location	280-18587 Lab ID	Sample Type	Date & Time Collected		Analytical Method
PAFB03-MW01-N-07282011	PAFB03-MW01	280-18587-1	N	28-Jul-2011	1300	A2320
PAFB03-MW01-N-07282011	PAFB03-MW01	280-18587-1	N	28-Jul-2011	1300	E300
PAFB03-MW01-N-07282011	PAFB03-MW01	280-18587-1	N	28-Jul-2011	1300	E300
PAFB03-MW01-N-07282011	PAFB03-MW01	280-18587-1	N	28-Jul-2011	1300	SW6010B
PAFB03-MW01-N-07282011	PAFB03-MW01	280-18587-1	N	28-Jul-2011	1300	SW6020
PAFB03-MW01-N-07282011	PAFB03-MW01	280-18587-1	N	28-Jul-2011	1300	SW8260B
PAFB03-MW01-N-07282011	PAFB03-MW01	280-18587-1	N	28-Jul-2011	1300	SW9060
PAFB03-MW01-FD-07282011FD	PAFB03-MW01	280-18587-2FD	FD	28-Jul-2011	1310	A2320
PAFB03-MW01-FD-07282011FD	PAFB03-MW01	280-18587-2FD	FD	28-Jul-2011	1310	E300
PAFB03-MW01-FD-07282011FD	PAFB03-MW01	280-18587-2FD	FD	28-Jul-2011	1310	E300
PAFB03-MW01-FD-07282011FD	PAFB03-MW01	280-18587-2FD	FD	28-Jul-2011	1310	SW6010B
PAFB03-MW01-FD-07282011FD	PAFB03-MW01	280-18587-2FD	FD	28-Jul-2011	1310	SW6020
PAFB03-MW01-FD-07282011FD	PAFB03-MW01	280-18587-2FD	FD	28-Jul-2011	1310	SW8260B
PAFB03-MW01-FD-07282011FD	PAFB03-MW01	280-18587-2FD	FD	28-Jul-2011	1310	SW9060
PAFB03-MW03-N-07282011	PAFB03-MW03	280-18587-3	N	28-Jul-2011	1500	A2320
PAFB03-MW03-N-07282011	PAFB03-MW03	280-18587-3	N	28-Jul-2011	1500	E300
PAFB03-MW03-N-07282011	PAFB03-MW03	280-18587-3	N	28-Jul-2011	1500	E300
PAFB03-MW03-N-07282011	PAFB03-MW03	280-18587-3	N	28-Jul-2011	1500	SW6010B
PAFB03-MW03-N-07282011	PAFB03-MW03	280-18587-3	N	28-Jul-2011	1500	SW6020
PAFB03-MW03-N-07282011	PAFB03-MW03	280-18587-3	N	28-Jul-2011	1500	SW8260B
PAFB03-MW03-N-07282011	PAFB03-MW03	280-18587-3	N	28-Jul-2011	1500	SW9060
PAFB03-MW04-N-07282011	PAFB03-MW04	280-18587-4	N	28-Jul-2011	1400	A2320
PAFB03-MW04-N-07282011	PAFB03-MW04	280-18587-4	N	28-Jul-2011	1400	E300
PAFB03-MW04-N-07282011	PAFB03-MW04	280-18587-4	N	28-Jul-2011	1400	E300
PAFB03-MW04-N-07282011	PAFB03-MW04	280-18587-4	N	28-Jul-2011	1400	SW6010B
PAFB03-MW04-N-07282011	PAFB03-MW04	280-18587-4	N	28-Jul-2011	1400	SW6020
PAFB03-MW04-N-07282011	PAFB03-MW04	280-18587-4	N	28-Jul-2011	1400	SW8260B
PAFB03-MW04-N-07282011	PAFB03-MW04	280-18587-4	N	28-Jul-2011	1400	SW9060
PAFB03-MW04-N-07282011MS	PAFB03-MW04	280-18587-4MS	MS	28-Jul-2011	1400	E300
PAFB03-MW04-N-07282011MS	PAFB03-MW04	280-18587-4MS	MS	28-Jul-2011	1400	E300
PAFB03-MW04-N-07282011MS	PAFB03-MW04	280-18587-4MS	MS	28-Jul-2011	1400	SW6010B
PAFB03-MW04-N-07282011MS	PAFB03-MW04	280-18587-4MS	MS	28-Jul-2011	1400	SW6020
PAFB03-MW04-N-07282011MS	PAFB03-MW04	280-18587-4MS	MS	28-Jul-2011	1400	SW8260B
PAFB03-MW04-N-07282011MS	PAFB03-MW04	280-18587-4MS	MS	28-Jul-2011	1400	SW9060
PAFB03-MW04-N-07282011SD	PAFB03-MW04	280-18587-4SD	SD	28-Jul-2011	1400	E300
PAFB03-MW04-N-07282011SD	PAFB03-MW04	280-18587-4SD	SD	28-Jul-2011	1400	E300
PAFB03-MW04-N-07282011SD	PAFB03-MW04	280-18587-4SD	SD	28-Jul-2011	1400	SW6010B
PAFB03-MW04-N-07282011SD	PAFB03-MW04	280-18587-4SD	SD	28-Jul-2011	1400	SW6020
PAFB03-MW04-N-07282011SD	PAFB03-MW04	280-18587-4SD	SD	28-Jul-2011	1400	SW8260B
PAFB03-MW04-N-07282011SD	PAFB03-MW04	280-18587-4SD	SD	28-Jul-2011	1400	SW9060
PAFB03-MW06-N-07282011	PAFB03-MW07	280-18587-5	N	28-Jul-2011	1520	SW8260B
PAFB-TRIP-TB-07282011	FIELDQC	280-18587-6	TB	28-Jul-2011	1300	SW8260B

FD = Field duplicate

N = Normal investigative sample

MS = Matrix spike

SD = MS Duplicate

TB = Trip Blank

WG = Groundwater

WQ = Aqueous blank samples

DATA COMPLIANCE SUMMARY

Based on the data compliance review, data for the above samples are:

	Acceptable for use
X	Acceptable as qualified
	Some data unacceptable for use
	All data unacceptable for use

Sample Integrity

1. The sample containers were received intact, within the temperature acceptance criteria of $\leq 6^{\circ}\text{C}$ (degrees Celsius), and properly preserved on 7/28/11 and 07/29/2011 at Test America Laboratories, Inc.
2. Dedicated sample equipment was used and an equipment blank was not required
3. Discrepancies were observed for sample receipt as follows:

SDG 280-18532:

- Sample PAFB03-MW02 N-07272011 on the chain-of-custody form (CoC) had a sample collection time of 1340 and the sample container a collection time of 1320; the collection time on the sample container was verified to be correct and was used by the laboratory for reporting.
- The sample identifier for sample PAFB03-MW05 N-07272011 was not written on the sample container. The collection time on the sample container was used to verify the sample to the CoC identifier.
- The CoC listed 250 mL nitric acid preserved bottles but the shipment contained 500 mL nitric preserved bottles. The discrepancy was noted by the lab but no corrective action was required.

SDG 280-18587:

- Samples PAFB03-MW01- FD-07282011 and PAFB03-MW03-N-07282011 on the CoC had sample labels of PAFB07-MW01- FD-07282011 and PAFB07-MW03-N-07282011 respectively; the sample ID on the CoC form was verified to be correct and was used by the laboratory for reporting.
- Sample PAFB03-MW04-N on the CoC form was logged in as PAFB03-MW04-N-07282011 to add the collection date per the project specification.

Method 6020, total and dissolved - (5 investigative, 1 field duplicate, and 1 MS/MSD aqueous samples)

1. The following QC items were evaluated : hold times, method blanks (MBs), laboratory control sample (LCS) percent recoveries (%Rs), initial and continuing calibration blanks (ICBs and CCBs), initial and continuing calibration verifications (ICVs, CCVs), interference check standards (ICSA and ICSAB), RL check standard %Rs, matrix spike/matrix spike duplicate (MS/MSD) %Rs and relative percent difference (RPD), serial dilution percent differences (%Ds), post digestion spike (PDS) %Rs, field duplicate RPDs and comparison of reported results to the raw data. All dissolved metals results were verified to be less than or equal to the total metals results for each sample.

The following QC parameters met criteria: holding times, LCS %R, MS/MSD RPD, PDS %R, serial dilution %Ds, ICVs, CCVs, ICSAB %Rs, the RL check standard %Rs, and comparison of reported results to raw data.

2. Total thallium was detected in the MBs associated with the investigative samples reported in SDG 280-18532 and SDG 280-18587 at concentrations between the MDL and RL (0.0202 and 0.0269 ug/L). Total thallium was detected in several of the associated samples at concentrations less than the RL of 0.20ug/L and

these results were UB qualified as not detected. No other method 6020 metals were detected in the associated method blanks.

3. Thallium was detected in the CCBs associated with both total and dissolved samples at concentrations between the MDL and RL (concentrations up to 0.031µg/L). Total thallium detected in associated samples at concentrations <RL were previously UB qualified as not detected, dissolved thallium was detected in several of the associated samples at concentrations less than the RL of 0.20µg/L and these results were UB qualified as not detected at the RL.
4. The PDS and serial dilution analyses were performed on project sample PAFB03-MW04-N-072811. The serial dilution was not applicable and %Ds were not evaluated. Control limits were met for the PDS and no sample qualification was required.
5. The MS/MSD analyses were performed on project samples PAFB03-MW04-N-072811 for both the total and dissolved samples. Control limits were met with the exception that the recoveries for total antimony were less than the 80-120% criteria at 46% and 42%. All total antimony results were M qualified to indicate a matrix effect causing a potential low bias to the results.
6. Sample location PAFB03-MW01 (reported in SDG 280-18587-1) was collected as a field duplicate pair for both total and dissolved metals. Results are summarized in the following table, nc means not calculated because either one or both of the results were less than the RL. The RPD in bold for total thallium exceeded the control criteria of ≤15% and all total thallium results for samples included in this validation report were J qualified as estimated. No other qualification was required.

Analyte	Units	Concentration		RL	RPD
		Parent	Duplicate		
Total					
Antimony	ug/L	0.14	0.15	1.0	nc
Cadmium	ug/L	0.57	0.37	2.0	nc
Selenium	ug/L	4.3	3.8	2.0	12
Thallium	ug/L	0.43	0.36	0.20	18
Dissolved					
Antimony	ug/L	0.13	0.15	1.0	nc
Cadmium	ug/L	0.087	0.14	2.0	nc
Selenium	ug/L	1.7	1.8	2.0	nc
Thallium	ug/L	0.067	0.095	0.20	nc

7. The analysis of the ICSA interference check standard solution by Method 6020 shows concentrations for antimony, cadmium and thallium at levels greater than 2 times the MDL for both total and dissolved metals analyses. The laboratory narrative indicated that the solution contained trace impurities and that the results are not due to matrix interference. No data qualifiers were assigned.

Method 6010B total and dissolved - (7 investigative, 2 field duplicates, 1 MS/MSD)

1. The following QC items were evaluated : hold times, method blanks (MBs), laboratory control sample (LCS) percent recoveries (%Rs), initial and continuing calibration blanks (ICBs and CCBs), initial and continuing calibration verifications (ICVs, CCVs), interference check standards (ICSA and ICSAB), RL check standard %Rs, matrix spike/matrix spike duplicate (MS/MSD) %Rs and relative percent difference (RPD), serial dilution percent differences (%Ds), post digestion spike (PDS) %Rs, field duplicate RPDs and comparison of reported results to the raw data.

The following QC parameters met criteria: holding time, LCS %R, MS/MSD RPDs, ICBs, CCBs, ICVs, CCVs, ICSAB %Rs, the RL check standard %Rs, and comparison of reported results to raw data.

2. Total and dissolved sodium were detected in the method blanks associated with the investigative samples at concentrations between the MDL and RL (203 and 149 ug/L respectively). Sodium was detected in the associated samples at concentrations greater than the reporting limit and no results were qualified.
3. The analysis of the ICSA interference check standard solution showed results for chromium, copper and vanadium at a level greater than 2 times the MDL for total metals and chromium, copper, lead and vanadium for dissolved metals analysis. The laboratory indicated that the solution contained the trace impurities and that the results are not due to matrix interference. No data qualifiers were assigned.
4. Sample location PAFB03-MW01 was used for the field duplicate for total and dissolved metals and sample PAFB07-MW03 for total and dissolved lead only, results are summarized in the table below. The calculated RPD for metals shown in bold exceeded the control criteria of $\leq 15\%$ and all results for samples included in this validation report were J qualified as estimated. Only site PAFB07 samples were J qualified as a result of the PAFB07-MW03 sample results. Samples that had been qualified J or M for alternate reasons required no further qualification.

Analyte	Units	Concentration		RL	RPD
		Parent	Duplicate		
Total Metals- PAFB03-MW01					
Arsenic	ug/L	12	11	30	nc
Barium	ug/L	350	300	50	15
Beryllium	ug/L	1.8	1.5	4.0	nc
Calcium	ug/L	79000	73000	1100	8
Chromium	ug/L	76	61	10	22
Cobalt	ug/L	14	12	60	nc
Copper	ug/L	34	28	10	19
Lead	ug/L	36	32	25	12
Magnesium	ug/L	22000	20000	1000	10
Nickel	ug/L	35	28	20	22
Potassium	ug/L	7100	6100	1000	15
Vanadium	ug/L	95	80	10	17
Zinc	ug/L	140	120	20	15
Sodium	ug/L	21000	19000	1000	10
Dissolved Metals- PAFB03-MW01					
Barium	ug/L	64	98	50	42
Calcium	ug/L	71000	76000	1100	7
Chromium	ug/L	4.6	6.9	10	nc
Cobalt	ug/L	U	2.4	60	nc
Copper	ug/L	4.2	8.0	10	nc
Lead	ug/L	U	6.9	25	nc
Magnesium	ug/L	11000	13000	1000	17
Nickel	ug/L	2.3	4.5	20	nc
Potassium	ug/L	2100	2000	1000	5
Vanadium	ug/L	6.5	9.4	10	nc
Zinc	ug/L	10	26	20	nc
Sodium	ug/L	21000	22000	1000	5
Total Metals- PAFB07-MW03					
Lead	ug/L	14	17	9.0	19

U–Undetected; the analyte was not detected.

5. The serial dilution and PDS analyses were performed on PAFB03-MW04-N-072811 samples for total and dissolved metals. Serial dilution %Ds (where applicable) and PDS %Rs were in control. Qualification was not required.
6. The total and dissolved metals MS/MSD analyses were also performed using project sample PAFB03-MW04-N-072811. All total and dissolved metals %Rs and RPDs were within control limits and qualification was not required.

Method 8260B VOCs (6 investigative, 1 field duplicate, 1 MS/MSD, and 2 trip blank aqueous samples)

1. The following QC items were evaluated for all samples: initial calibration (ICAL), second source calibration verification standard (SSCV), continuing calibration verification standard (CCV), GC/MS tunes, and internal standard area counts and retention times, holding times, MBs, surrogate %Rs, LCS %Rs, MS/MSD %Rs and RPDs, trip blanks, field duplicate RPDs, and reporting limits (RLs).

The following QC parameters met criteria: holding times, surrogate %Rs, MS/MSD %Rs, field duplicate RPDs, RLs, ICAL, CCV, GC/MS tunes, and internal standard area counts and retention times.

2. Samples were unpreserved and a hold time of 7 days from collection to analysis was met.
3. VOCs were not detected in the associated method blanks (MBs) with the exception of methylene chloride at 0.613µg/L in the blank associated with batch 280-18587 and at 0.423µg/L in the blank associated with 280-18532, concentrations less than the 2.0µg/L RL.
4. A trip blank was included with each sample shipment. Methylene chloride was detected in PAFB-TRIP-TB-07272011 (0.98µg/L) and PAFB-TRIP-TB-07282011 (0.65µg/L) at concentrations less than the 2.0µg/L RL. Because methylene chloride was also detected in the associated method blanks, concentrations less than the RL of 2.0µg/L in the TB and investigative samples were U B qualified based on the observed blank detection and methylene chloride should be considered not detected at the RL.

Chloroform was also detected in PAFB-TRIP-TB-07272011 (0.095ug/L) less than the RL. Chloroform was either not detected or detected at a concentration greater than the RL in the associated samples and qualification for chloroform was not required. No other TB detections were observed.

5. The LCS associated with batch 280-18532 did not include summary results for the following analyte:
 - Methyl Iodide

This analyte was included in the CCV with acceptable results and data qualification was not necessary.

6. A MS/MSD was analyzed from site PAFB03-MW04 and results were provided with SDG 280-18587. This MS/MSD was used for evaluation of all project samples included in this data validation report. All target analyte %Rs and RPDs were within the DoD QSM criteria with one exception. The RPD for acetone (35%) exceeded the criteria of ≤20%. Acetone was detected in sample PAFB03-MW05-N-07272011 and the result was M qualified. Acetone was not detected in the remainder of the project samples and no other qualification was required.

The MS/MSD did not include summary results for the following analytes:

- Acrylonitrile
- trans-1,4-Dichloro-2-butene

Raw data indicated that acrylonitrile was not detected in the MS/MSD samples. The laboratory reviewed the MS/MSD spike solution and reported that acrylonitrile had not been added to the solution. All project sample results for acrylonitrile were accepted based on the LCS and CCV recoveries. Qualification was not performed for trans-1,4-dichloro-2-butene which had an observed concentration in the MS/MSD analyses.

- VOC target analytes were not detected greater than the RL in either the parent sample or field duplicate collected from site PAFB03-MW01. RPDs were not calculated and no sample qualification was required.

Method 300 – Major Anions (5 aqueous samples, 1 field duplicate and 1 MS/MSD)

- The following QC items were evaluated and met criteria: holding times, ICAL, ICB, CCBs, ICV, CCVs, MBs, LCS/LCSD %Rs and RPDs, MS/MSD %Rs and RPDs and laboratory duplicate RPDs.
- An MS/MSD was performed on sample PAFB03-MW04-N-072811 and results were provided with SDG 280-18587. %Rs and RPDs were within control criteria, and no sample qualification was necessary. An MS/MSD was also performed on a non-project sample and results were provided with SDG 280-18532. Non-project MS/MSDs were considered but were not utilized to qualify project samples since matrix similarity to project samples could not be guaranteed.
- A field duplicate pair was collected from location PAFB03-MW01-N-072811 and results were reported in SDG 280-18587. Results for anions detected in either the parent or duplicate sample are shown below. Calculated RPDs were less than the control criteria of 15% and data qualifiers were not required.

Analyte	Units	Concentration		RPD
		Parent	Duplicate	
Chloride	mg/L	20	20	0
Nitrate as N	mg/L	3.9	3.9	0
Sulfate	mg/L	23	23	0

- Sample PAFB03-MW-3-N-072811 was analyzed at a dilution for nitrate as nitrogen due to high sample concentration. The reporting limit was raised accordingly. No sample qualification was necessary.

Method SM2320 Total, Carbonate, and Bicarbonate Alkalinity (5 aqueous samples and 1 field duplicate)

- The following QC items were evaluated and met criteria: holding times and MB. Per the QAPP, alkalinity data are defined as screening data and required QC is a field duplicate at a frequency of 10%.
- The analytical method specified in the QAPP was EPA 310.1. The analytical method reported as being used in the data package was SM2320B. No action was required due to this change.
- A field duplicate pair was collected from location PAFB03-MW01-N-072811 and results were provided with SDG 280-18587. Bicarbonate alkalinity was detected at 210mg/L in both samples, with an RPD equal to 0%, within the $\leq 20\%$ RPD aqueous QC acceptance criteria. Data qualification is not required.

Method 9060 Total Organic Carbon (5 aqueous samples, 1 field duplicate, and 1 MS/MSD)

- The following QC items were evaluated and met criteria: holding times, ICAL, ICB, ICVs, CCBs, CCVs, MBs, LCS/LCSD %Rs and RPDs, MS/MSD %Rs and RPDs.
- TOC was detected in the ICB and CCBs associated with project samples in SDGs 280-18532 and 280-18587 in QC batch 79954 at concentrations $< \frac{1}{2}$ RL and TOC was detected in project samples at concentrations $> \text{RL}$; therefore, data qualification was not required.

TOC was detected in the MB, ICB and CCBs in SDGs 280-18532 and 280-18587 in QC batch 80178 at concentrations $< \frac{1}{2}$ RL (RL equals 1.0mg/L). The two samples associated with this analytical batch, 280-18532- 1 (PAFB03-MW02-N-07272011) and 280-18587-1 (PAFB03-MW01-N-07282011), had detected

concentrations of TOC. TOC was detected in sample 280-18532- 1 at a concentration >RL at 2.9mg/L and data qualification was not required.

TOC was detected in sample 280-18587-1 at 0.98 mg/L, slightly less than the RL but nearly greater than 4x the MB concentration of 0.254mg/L. Because the found concentration was confirmed with a detection greater than the RL in an associated field duplicate, and both results were J qualified due to field duplicate variability, additional data qualification for the method blank contamination was not required.

3. TOC MS/MSDs were performed per SDG on samples PAFB03-MW04-N-072811 (280-18587-4) and PAFB03-MW02-N-072711 (280-18532-1). %Rs and RPDs were within control criteria and sample qualification was not necessary.
4. A laboratory duplicate was not performed in either SDG 18532 or SDG 18587 for this method, and an assessment could not be made. However, since the LCS/LCSD RPD and MS/MSD RPD were within criteria, laboratory precision was met and data usability was not affected.
5. A field duplicate pair was collected from location PAFB03-MW01-N-072811 and results were provided with SDG 280-18587. TOC results are shown below. The calculated RPD was greater than the control criteria of 20%. All TOC results were J qualified as estimated as a result of the RPD exceedance.

Analyte	Units	Concentration		RPD
		Parent	Duplicate	
TOC	mg/L	0.98	1.4	35

Reviewer: Bedil L. Sidi Date: 03/20/2012

QC Reviewer: H. M. L. Date: 3-20-12

Database Entry Person: [Signature] Date: 3/20/2012

Sample Qualifier Summary Table

Field Sample ID	280-18587-1 Laboratory ID	Test Method	Target Analyte	Result	Validation Flags	Reason
PAFB03-MW01-N-07282011	280-18587-1	SW6010B	Barium- Diss	64	J	Field Duplicate failed $\leq 15\%$ RPD Criteria
PAFB03-MW01-N-07282011	280-18587-1	SW6010B	Magnesium- Diss	11000	J	
PAFB03-MW01-N-07282011	280-18587-1	SW6010B	Chromium	76	J	
PAFB03-MW01-N-07282011	280-18587-1	SW6010B	Copper	34	J	
PAFB03-MW01-N-07282011	280-18587-1	SW6010B	Nickel	35	J	
PAFB03-MW01-N-07282011	280-18587-1	SW6010B	Vanadium	95	J	
PAFB03-MW01-FD-07282011FD	280-18587-2FD	SW6010B	Barium- Diss	98	J	
PAFB03-MW01-FD-07282011FD	280-18587-2FD	SW6010B	Magnesium- Diss	13000	J	
PAFB03-MW01-FD-07282011FD	280-18587-2FD	SW6010B	Chromium	61	J	
PAFB03-MW01-FD-07282011FD	280-18587-2FD	SW6010B	Copper	28	J	
PAFB03-MW01-FD-07282011FD	280-18587-2FD	SW6010B	Nickel	28	J	
PAFB03-MW01-FD-07282011FD	280-18587-2FD	SW6010B	Vanadium	80	J	
PAFB03-MW03-N-07282011	280-18587-3	SW6010B	Barium- Diss	78	J	
PAFB03-MW03-N-07282011	280-18587-3	SW6010B	Magnesium- Diss	23000	J	
PAFB03-MW03-N-07282011	280-18587-3	SW6010B	Chromium	7.7	J	
PAFB03-MW03-N-07282011	280-18587-3	SW6010B	Copper	5.6	J	
PAFB03-MW03-N-07282011	280-18587-3	SW6010B	Nickel	11	J	
PAFB03-MW03-N-07282011	280-18587-3	SW6010B	Vanadium	11	J	
PAFB03-MW04-N-07282011	280-18587-4	SW6010B	Barium- Diss	77	J	
PAFB03-MW04-N-07282011	280-18587-4	SW6010B	Magnesium- Diss	12000	J	
PAFB03-MW04-N-07282011	280-18587-4	SW6010B	Chromium	20	J	
PAFB03-MW04-N-07282011	280-18587-4	SW6010B	Copper	13	J	
PAFB03-MW04-N-07282011	280-18587-4	SW6010B	Nickel	11	J	
PAFB03-MW04-N-07282011	280-18587-4	SW6010B	Vanadium	36	J	
PAFB03-MW01-N-07282011	280-18587-1	SW6020	Thallium- Diss	0.067	B	Method and Instrument Blank Detections less than RL – Associated Results <RL are not detected at the RL.
PAFB03-MW01-FD-07282011FD	280-18587-2FD	SW6020	Thallium- Diss	0.095	B	
PAFB03-MW03-N-07282011	280-18587-3	SW6020	Thallium	0.1	B	
PAFB03-MW03-N-07282011	280-18587-3	SW6020	Thallium- Diss	0.025	B	
PAFB03-MW04-N-07282011	280-18587-4	SW6020	Thallium	0.18	B	
PAFB03-MW04-N-07282011	280-18587-4	SW6020	Thallium- Diss	0.053	B	
PAFB03-MW01-N-07282011	280-18587-1	SW6020	Thallium	0.43	J	Field Duplicate failed $\leq 15\%$ RPD Criteria

Sample Qualifier Summary Table

Field Sample ID	280-18587-1 Laboratory ID	Test Method	Target Analyte	Result	Validation Flags	Reason
PAFB03-MW01-FD-07282011FD	280-18587-2FD	SW6020	Thallium	0.36	J	Field Duplicate failed $\leq 15\%$ RPD Criteria
PAFB03-MW01-N-07282011	280-18587-1	SW6020	Antimony	0.14	M	Low MS/MSD Recoveries (46% & 42%) – Less than 80-120% Criteria
PAFB03-MW01-FD-07282011FD	280-18587-2FD	SW6020	Antimony	0.15	M	
PAFB03-MW03-N-07282011	280-18587-3	SW6020	Antimony	0.35	M	
PAFB03-MW04-N-07282011	280-18587-4	SW6020	Antimony	0.18	M	
PAFB03-MW01-N-07282011	280-18587-1	SW8260B	Dichloromethane	0.45	B	Trace detections observed in Analytical/Method blank – All samples not detected at the RL.
PAFB03-MW01-FD-07282011FD	280-18587-2FD	SW8260B	Dichloromethane	0.42	B	
PAFB03-MW03-N-07282011	280-18587-3	SW8260B	Dichloromethane	0.46	B	
PAFB03-MW04-N-07282011	280-18587-4	SW8260B	Dichloromethane	0.41	B	
PAFB03-MW06-N-07282011	280-18587-5	SW8260B	Dichloromethane	0.48	B	
PAFB-TRIP-TB-07282011	280-18587-6	SW8260B	Dichloromethane	0.65	B	
PAFB03-MW01-N-07282011	280-18587-1	SW9060	Total Organic Carbon	0.98	J	Field Duplicate failed $\leq 15\%$ RPD Criteria
PAFB03-MW01-FD-07282011FD	280-18587-2FD	SW9060	Total Organic Carbon	1.4	J	
PAFB03-MW03-N-07282011	280-18587-3	SW9060	Total Organic Carbon	1.5	J	
PAFB03-MW04-N-07282011	280-18587-4	SW9060	Total Organic Carbon	1.6	J	

Field Sample ID	280-18532-1 Laboratory ID	Test Method	Target Analyte	Result	Validation Flags	Reason
PAFB03-MW02-N-07272011	280-18532-1	SW6010B	Barium - Diss	19	J	Field Duplicate failed $\leq 15\%$ RPD Criteria
PAFB03-MW02-N-07272011	280-18532-1	SW6010B	Chromium	11	J	
PAFB03-MW02-N-07272011	280-18532-1	SW6010B	Copper	7.3	J	
PAFB03-MW02-N-07272011	280-18532-1	SW6010B	Lead	10	J	
PAFB03-MW02-N-07272011	280-18532-1	SW6010B	Magnesium- Diss	8900	J	
PAFB03-MW02-N-07272011	280-18532-1	SW6010B	Nickel	7.4	J	
PAFB03-MW02-N-07272011	280-18532-1	SW6010B	Vanadium	21	J	
PAFB03-MW05-N-07272011	280-18532-2	SW6010B	Barium- Diss	100	J	
PAFB03-MW05-N-07272011	280-18532-2	SW6010B	Chromium	49	J	
PAFB03-MW05-N-07272011	280-18532-2	SW6010B	Copper	24	J	

Sample Qualifier Summary Table

Field Sample ID	280-18532-1 Laboratory ID	Test Method	Target Analyte	Result	Validation Flags	Reason
PAFB03-MW05-N-07272011	280-18532-2	SW6010B	Lead	27	J	
PAFB03-MW05-N-07272011	280-18532-2	SW6010B	Magnesium- Diss	16000	J	
PAFB03-MW05-N-07272011	280-18532-2	SW6010B	Nickel	19	J	
PAFB03-MW05-N-07272011	280-18532-2	SW6010B	Vanadium	61	J	
PAFB07-MW01-N-07272011	280-18532-3	SW6010B	Lead	5.9	J	
PAFB07-MW03-N-07272011	280-18532-4	SW6010B	Lead	14	J	
PAFB07-MW03-FD-07272011FD	280-18532-5FD	SW6010B	Lead	17	J	
PAFB03-MW02-N-07272011	280-18532-1	SW6020	Antimony	0.24	M	Low MS/MSD Recoveries (46% & 42%) – Less than 80-120% Criteria
PAFB03-MW05-N-07272011	280-18532-2	SW6020	Antimony	0.21	M	
PAFB03-MW05-N-07272011	280-18532-2	SW6020	Thallium	0.37	J	Field Duplicate failed $\leq 15\%$ RPD Criteria
PAFB03-MW02-N-07272011	280-18532-1	SW6020	Thallium	0.17	B	Trace detections observed in Analytical/Method blank – All samples not detected at the RL.
PAFB03-MW02-N-07272011	280-18532-1	SW6020	Thallium- Diss	0.033	B	
PAFB03-MW05-N-07272011	280-18532-2	SW6020	Thallium- Diss	0.065	B	
PAFB03-MW05-N-07272011	280-18532-2	SW8260B	Acetone	28	M	MS/MSD RPD greater than Criteria.
PAFB03-MW02-N-07272011	280-18532-1	SW8260B	Dichloromethane	0.49	B	Trace detections observed in Analytical/Method blank – All samples not detected at the RL.
PAFB03-MW05-N-07272011	280-18532-2	SW8260B	Dichloromethane	0.98	B	
PAFB-TRIP-TB-07272011	280-18532-6	SW8260B	Dichloromethane	0.98	B	
PAFB03-MW02-N-07272011	280-18532-1	SW9060	Total Organic Carbon	2.9	J	Field Duplicate failed $\leq 15\%$ RPD Criteria
PAFB03-MW05-N-07272011	280-18532-2	SW9060	Total Organic Carbon	4	J	

Analytical Data

Client: AECOM Technical Services Inc.

Job Number: 280-18532-1

Client Sample ID: PAFB07-MW01-N-07272011

Lab Sample ID: 280-18532-3

Client Matrix: Water

Date Sampled: 07/27/2011 1220

Date Received: 07/28/2011 0900

6010B Metals (ICP)

Analysis Method:	6010B	Analysis Batch:	280-80410	Instrument ID:	MT_025
Prep Method:	3010A	Prep Batch:	280-79149	Lab File ID:	25A5080811.asc
Dilution:	1.0			Initial Weight/Volume:	50 mL
Analysis Date:	08/08/2011 1854			Final Weight/Volume:	50 mL
Prep Date:	08/08/2011 0900				

Analyte	Result (ug/L)	Qualifier	MDL	RL
Lead	5.9 <i>J</i>	F Q	2.6	9.0

6010B Metals (ICP)-Dissolved

Analysis Method:	6010B	Analysis Batch:	280-80413	Instrument ID:	MT_025
Prep Method:	3005A	Prep Batch:	280-79147	Lab File ID:	25A7080811.asc
Dilution:	1.0			Initial Weight/Volume:	50 mL
Analysis Date:	08/09/2011 0835			Final Weight/Volume:	50 mL
Prep Date:	08/08/2011 0900				

Analyte	Result (ug/L)	Qualifier	MDL	RL
Lead	2.6	U	2.6	25

10/17/11
afp

Analytical Data

Client: AECOM Technical Services Inc.

Job Number: 280-18532-1

Client Sample ID: PAFB07-MW03-N-07272011

Lab Sample ID: 280-18532-4

Date Sampled: 07/27/2011 1100

Client Matrix: Water

Date Received: 07/28/2011 0900

6010B Metals (ICP)

Analysis Method: 6010B

Analysis Batch: 280-80410

Instrument ID: MT_025

Prep Method: 3010A

Prep Batch: 280-79149

Lab File ID: 25A5080811.asc

Dilution: 1.0

Initial Weight/Volume: 50 mL

Analysis Date: 08/08/2011 1857

Final Weight/Volume: 50 mL

Prep Date: 08/08/2011 0900

Analyte	Result (ug/L)	Qualifier	MDL	RL
Lead	14 J	Q	2.6	9.0

6010B Metals (ICP)-Dissolved

Analysis Method: 6010B

Analysis Batch: 280-80413

Instrument ID: MT_025

Prep Method: 3005A

Prep Batch: 280-79147

Lab File ID: 25A7080811.asc

Dilution: 1.0

Initial Weight/Volume: 50 mL

Analysis Date: 08/09/2011 0838

Final Weight/Volume: 50 mL

Prep Date: 08/08/2011 0900

Analyte	Result (ug/L)	Qualifier	MDL	RL
Lead	2.6	U	2.6	25

10/17/11
KHP

Analytical Data

Client: AECOM Technical Services Inc.

Job Number: 280-18532-1

Client Sample ID: PAFB07-MW03-FD-07272011

Lab Sample ID: 280-18532-5

Date Sampled: 07/27/2011 1135

Client Matrix: Water

Date Received: 07/28/2011 0900

6010B Metals (ICP)

Analysis Method: 6010B

Analysis Batch: 280-80410

Instrument ID: MT_025

Prep Method: 3010A

Prep Batch: 280-79149

Lab File ID: 25A5080811.asc

Dilution: 1.0

Initial Weight/Volume: 50 mL

Analysis Date: 08/08/2011 1859

Final Weight/Volume: 50 mL

Prep Date: 08/08/2011 0900

Analyte	Result (ug/L)	Qualifier	MDL	RL
Lead	17 <i>J</i>	Q	2.6	9.0

6010B Metals (ICP)-Dissolved

Analysis Method: 6010B

Analysis Batch: 280-80413

Instrument ID: MT_025

Prep Method: 3005A

Prep Batch: 280-79147

Lab File ID: 25A7080811.asc

Dilution: 1.0

Initial Weight/Volume: 50 mL

Analysis Date: 08/09/2011 0840

Final Weight/Volume: 50 mL

Prep Date: 08/08/2011 0900

Analyte	Result (ug/L)	Qualifier	MDL	RL
Lead	2.6	U	2.6	25

*10/17/11
KMP*

APPENDIX B
STATISTICAL EVALUATION COMPUTATION RESULTS
(On CD)

Lead-Total	Lead-Total	PAFB07-I	PAFB07-MW03	Total	Analyte ND?	ANOVA	raw	rank	KW	Rank forLead-Total Concentration								
Lead-Total	1	12.5	38		No		12.5	2		WELL	PAFB07-M\ PAFB07-MW03	Total						
Lead-Total	2	5.9	17			SS	5.9	1		Qtr 1	2	8						
Lead-Total	3	34	34		BTWN Groups	158.42	1	158.42	1.236	5.9874	Qtr 2	1	3					
Lead-Total	4	28	27		W/IN Groups	769.02	6	128.17		df 1,6	Qtr 3	6.5	6.5					
Lead-Total	Count	4	4	8	Total	927.44	7				Qtr 4	5	4					
Lead-Total	SUM	80.4	116	196.4			17	3			n	4	4					
Lead-Total	SUM(x2)	2131.06	3618	5749.06			34	6.5			SUM(xi)	14.5	21.5					
Lead-Total	St.Dev.	13.10242	9.201449	11.51049			27	4			SUM(xi2)	72.25	131.25					
Lead-Total	Mean	20.1	29	24.55	Variance	Max					StDev	2.561738	2.286737					
Lead-Total	SS	515.02	254	927.44		Min					CV	0.706686	0.425439					
Lead-Total	Variance	171.6733	84.66667			Variance					MEAN	3.625	5.375					
Lead-Total											SS	19.6875	15.6875					
Lead-Total	Lead-Total is a detected analyte.																	
Lead-Total	Since both wells have the same number of samples, ANOVA is a robust measure of variance among the means of the wells.																	
Lead-Total	Fcalc is less than Fcrit; the assumption of equal variances holds true and there is no evidence of significant contamination.																	
Lead-Total	From KW: Hcalc is less than Hcrit; the assumption of equal variances holds true and there is no evidence of significant contamination.																	
Lead-Total																		
Lead-Total	Confidence Interval																	
Lead-Total		t-crit	LowerLim	UpperLim	CDPHE GW LL > Screen?													
Lead-Total	PAFB07-MW01	4.541	-9.64904	49.84904	50	No												
Lead-Total	PAFB07-MW03	4.541	8.10811	49.89189	50	No												
Lead-Total																		
Lead-Total																		
Lead-Total																		
Lead-Total																		
Lead-Total	Since the lower limit of the mean confidence interval is less than the regulatory limit, the unit remains in compliance for Lead-Total.																	

Kruskal-Wallis					
	SS	dFreedom	Mean Distribution	H	Hcrit
BTWN Wel	6.125	1	6	1.020833	3.841459
Hcrit with 95% probability and 1 degrees of freedom					

APPENDIX C
RESPONSES TO REGULATORY COMMENTS

STATE OF COLORADO

John W. Hickenlooper, Governor
Christopher E. Urbina, MD, MPH
Executive Director and Chief Medical Officer

Dedicated to protecting and improving the health and environment of the people of Colorado

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Colorado Department
of Public Health
and Environment

August 1, 2012

Mr. John Wright
Chief, Environmental Restoration Management
90 MW/EM
300 Vesle Drive, Suite 600
F. E. Warren Air Force Base, Wyoming 82005

Subject: June 4, 2012 document entitled "Draft Final Phase II Site Inspection, Rapier Site 9, Area 7," Peterson Air Force Base," Colorado Springs, Colorado.

Dear Mr. Wright:

The Colorado Department of Public Health and Environment, Hazardous Materials and Waste Management Division (the Division) received and has reviewed the subject document. Additionally, the Division reviewed the July 2012 "Technical Memorandum, Groundwater Flow Evaluation, Site 3 and Rapier Site 9, Area 7, Peterson Air Force Base, Colorado," sent by you via email on July 25, 2012.

Based on our review of both documents, the Division concurs the 2008 and 2009 groundwater elevation data should be used to establish the predominant groundwater flow direction at Rapier Site 9, Area 7 (i.e., groundwater flows westward). The 2011 and 2012 groundwater elevation data (i.e., Dry) from Well S7-MW2 should be flagged, disqualified, or otherwise invalidated in the Final subject document as suspect, as it appears inconsistent with the 2008 and 2009 data. However, groundwater quality data collected during 2011 and 2012 from Well S7-MW3, located on the downgradient side (i.e., west) of Landfill 1611 provides adequate representative downgradient groundwater quality data to demonstrate the basic groundwater standard for lead (Pb) is not exceeded and a No Further Action (NFA) is justified.

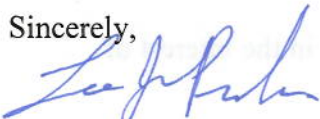
The Division provides the following comments on the subject document, in the interest of facilitating revisions to the final version.

1. Page ES-i (end of first full paragraph): incorrectly implies all three wells were sampled, please clarify.

2. Page ES-i (data table): Please check the sampling dates and ensure the "Depth to Groundwater" data are accurate, relative to data in the Technical Memorandum. This table indicates the four quarters of data (in this Phase II Site Inspection) were April 2011, November 2008, January 2009, and January 2012) when the actual quarters are April, July, and November 2011 and January 2012, based on Tables 3-1 through 3-4. As this table really adds nothing to the Executive Summary, especially without groundwater elevations provided, the Division suggests moving this table elsewhere, if necessary, or deleting it. Rather, add the Technical Memorandum to the subject document or the substantive information in the Technical Memorandum to the subject document, including Technical Memorandum Tables 1 and 2.
3. Page ES-i (beginning of second paragraph): Same as comment 1.
4. Page ES-ii (last paragraph): This paragraph indicates there's not a lead (Pb) issue at any of the three wells, based on a statistical evaluation. As Well S7-MW2 was deemed "Dry" during all four 2011/2012 quarters, it doesn't appear we need a statistical evaluation to make this determination for this well. This paragraph appears to incorrectly imply all three wells were sampled for groundwater (as in Comment 1) and groundwater quality data from all three wells demonstrates no groundwater standards are exceeded. Please clarify this text.
5. Page 3-1 (Section 3.1 (Groundwater Monitoring System)), last sentence of first paragraph states: "Monitoring well A7-MW03 lies in the downgradient portion of Area 7." Clarify, this determination is based on 2008/2009 data, not 2011/2012 data. Also clarify why wells in the text have an "A7" prefix, whereas those on Figure 3-1 have a "S7" prefix. Please make the well names consistent throughout the document, assuming they are the same wells.
6. Page 3-1 (Section 3.1 (Groundwater Monitoring System)), last sentence of third paragraph: Same as comment 5.
7. Table 4-1, Findings, first row: Same as Comment 1. Please clarify two of the three monitoring wells were sampled (eight samples total).
8. Figure 3-1: Please clarify the groundwater flow directions are based on 2008/2009 data, not 2011/2012 data.

Please don't hesitate to contact me at 303/692-3453 if you have any questions.

Sincerely,



Lee J. Pivonka
Federal Facility Remediation & Restoration Unit
Remediation Program
Hazardous Materials and Waste Management Division

cc: Ms. Kristine Andrews, Colorado Springs Airport
Ms. Elaine Kleckner, El Paso County Development Services
Mr. Mike McCarthy, El Paso County Department of Health and Environment
Mr. David Rathke, EPA Region 8
Ms. Hillary Richard, Portage, Inc.
Mr. Dan Rodriguez, PAFB

File – Peterson AFB, D016-1.1

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 8

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August 3, 2012

Ref: 8 EPR-F

Mr. John Wright
Chief, Environmental Restoration Management
90 MW/EM
300 Vesle Drive, Suite 600
F. E. Warren Air Force Base, Wyoming 82005

Subject: "Draft Final" – Phase II Site Inspection, Rapier Site 9, Area 7 – Peterson AFB, Colorado, June 2012.

Dear Mr. Wright:

The Environmental Protection Agency (EPA), Region 8 Federal Facilities Program has reviewed the "Draft Final" Phase II Site Inspection, Rapier Site 9, Area 7, Colorado, June 2012. EPA has no suggestions related to this report. In addition, EPA has reviewed the comments provide by CDPHE - Lee Pivonka and concur with his suggestions.

EPA concurs with Section 4.0 Conclusions and Recommendation. Specifically, EPA concurs with the No Further Action (NFA) recommendation. All lead samples were shown to be well below the standard (50 ug/L) at concentrations we typically see as background. I am not sure I understand why there was a need to do the statistical analysis to determine compliance with the standard.

Please contact me at 303/312-6016 or Rathke.David@EPA.GOV if there are any questions.

Sincerely,

A handwritten signature in blue ink, which appears to read "David Rathke", is positioned below the "Sincerely," text.

David Rathke
Federal Facilities Program

cc: Lee Pivonka, CDPHE
Hillary Richard, Portage, Inc



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Response to Comments on Draft Final Phase II Site Investigation
Rapier Site 9, Area 7
Peterson Air Force Base
Colorado Springs, Colorado
Submitted June 4, 2012
CDPHE Comments Dated 8/1/2012

Comment #	Section/Page	Comment	Response
Reviewer: Lee Pivonka, Colorado Department of Public Health and Environment			
GENERAL COMMENTS			
1	Executive Summary ES-i	End of first full paragraph: Incorrectly implies all three wells were sampled, please clarify.	The last sentence has been revised as follows: "As part of the Phase II SI, two existing wells at Area 7 were sampled (S7-MW1, and S7-MW3; S7-MW2 did not yield water) with the objective of detecting migration of contaminants, specifically lead, from the landfill contents to the underlying groundwater."
2	Executive Summary ES-i	Data table: Please check the sampling dates and ensure "depth to Groundwater" data are accurate, relative to data in the Technical Memorandum. This table indicates the four quarters of data (in this Phase II Site Inspection) were April 2011, November 2008, January 2009, and January 2012) when the actual quarters are April, July, and November 2011 and January 2012, based on Tables 3-1 through 3-4. As the table really adds nothing to the Executive Summary, especially without groundwater elevations provided, the Division suggests moving this table elsewhere, if necessary, or deleting it. Rather, add the Technical memorandum to the subject document or the substantive information in the Technical Memorandum to the subject document, including Technical Memorandum Tables 1 and 2.	The table in the Executive Summary has been removed as requested. Substantive information from the Technical Memorandum has been added to the report, as appropriate. Tables 1 and 2 of the Technical Memorandum have been added to the report as Tables 3-1 and 3-2.
3	Executive Summary ES-i	Beginning of second paragraph: Same as comment 1.	The first sentence of the second paragraph has been deleted. The Executive Summary has been revised to correctly indicate that only two wells were sampled during Phase II.

**Response to Comments on Draft Final Phase II Site Investigation
Rapier Site 9, Area 7
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Colorado Springs, Colorado
Submitted June 4, 2012
CDPHE Comments Dated 8/1/2012**

Comment #	Section/Page	Comment	Response
4	Executive Summary ES-ii	This paragraph indicates there's not a lead (Pb) issue at any of the three wells, based on a statistical evaluation. As well S7-MW2 was deemed "Dry" during all four 2011/2012 quarters, it doesn't appear we need a statistical evaluation to make this determination for this well. This paragraph appear to incorrectly imply all three wells were sampled for groundwater (as in Comment 1) and groundwater quality data from all three existing wells demonstrates no groundwater standards exceeded. Please clarify this text.	The text has been revised as follows: "There were no exceedances of lead (total or dissolved) in samples from S7-MW1 or S7-MW3. Monitoring well S7-MW2 did not yield water during each quarterly sampling event and therefore, could not be sampled. Based on Phase I water levels at Area 7, groundwater was determined to flow to the west. Water levels in monitoring wells S7-MW1 and S7-MW3 have not changed drastically from 2009 to 2012 and therefore it can be concluded that, despite the lack of water in S7-MW2, groundwater flow direction is still to the west, and S7-MW3 is located in the downgradient direction."
5	Section 3-1 Page 3-1	Last sentence of first paragraph states "Monitoring well A7-MW03 lies in the downgradient portion of Area." Clarify, this determination is based on 2008/2009 data, not 2011/2012 data. Also clarify why wells in the text have an "A7" prefix, whereas those on Figure 3-1 have a "S7" prefix. Please make all the well names consistent throughout the document, assuming they are the same wells.	The sentence has been revised as follows: "Monitoring well S7-MW3 lies in the downgradient portion of Area 7, based on an evaluation of water levels collected in April 2009." All well prefixes throughout the report have been revised to "S7".
6	Section 3.1 Page 3-1	Last sentence of third paragraph: Same as comment 5.	The sentence has been revised as follows: "During each sampling event, the groundwater elevation was measured in each well immediately prior to purging. Based on an evaluation of water levels collected in April 2009, the groundwater generally flows in a westerly direction (Figure 3-1)."
7	Table 4-1 1 st row	Same as Comment 1. Please clarify two of the three monitoring wells were sampled (eight samples total).	The table has been revised as requested.

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Peterson Air Force Base
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CDPHE Comments Dated 8/1/2012**

Comment #	Section/Page	Comment	Response
8	Figure 3-1	Please clarify the groundwater flow directions are based on 2008/2009 data, not 2011/2012 data.	The figure has been revised as requested.
EPA	N/A	EPA concurs with CDPHE comments and the path forward to NFA for Area 7; no additional comments (EPA letter dated 8/3/2012).	Comment noted.